Учебные задания по аннотированию и реферированию для 4 – го факультета

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Аннотирование

Аннотирование - вторичная обработка письменной информации. Аннотация - (Abstract or Summary) краткая справка о статье, книге и т.п. с точки зрения содержания. Материал излагается в предельно сжатой форме.

Требования к аннотации.

1. Лаконичность языка, т.е. использование простых предложений (глаголы употребляются всегда в настоящем времени в действительном или страдательном залоге; модальные глаголы отсутствуют).
2. Строгая логическая структура текста аннотации.
3. Обязательное введение в текст английских безличных конструкций, с помощью которых происходит введение и описание текста оригинала.

Key-patterns

1. The article (text) deals with...
2. As the title implies the article describes...
3. It is specially noted...
4. A mention should be made...
5. It is spoken in detail...
6. It is reported...
7. The text gives a valuable information on...
8. Much attention is given to...
9. The article gives a detailed analysis of...
10. It should be stressed (emphasized) that...
11. The title (name, head line, heading) of the article is...
12. The article consists of (contains, includes, falls into) ... (3) parts, sections.
13. The subject (topic, theme) of the article (text) is...
14. The article provides the reader with some data on ... (some material / information on)...
15. The purpose (aim, object) of the article (text) is to provide...

UNIT 1. Magnesium.

I. Просмотрите следующие слова, они помогут вам в работе над текстом Magnesium:

Ratio	отношение, коэффициент
Bulky	большой, громоздкий
Stiff	жесткий, крепкий
Inherent	свойственный, внутренне присущий
Appropriate	подходящий, соответствующий
Ductility	вязкость, пластичность, тягучесть, ковкость

To accompany	сопровождать
Detrimental	вредный
Competitive	соперничающий, конкурентоспособный
Tolerance limit	допустимый предел
Content	содержание
Immersion	погружение
Dip	погружение

II. *Переведите производные:*

Limit-limited-unlimited-limitation,
Compete-competitive-competition-competitively.
Resist-resistance-resistant.
Protect-protection-protective.
Pure-purity-impurity.
Corrode-corrosion-corrosive.

III. *Сгруппируйте слова близкие по значению:*

Bulkier	To burn
To work	Powders
To oxidize	Suitable
To withstand	Immersion
Fine particles	Thicker
Appropriate	To machine
Dip	To overcome

IV. *Сгруппируйте слова противоположные по значению:*

Favorable	Inferior
Superior	Unlimited
Alloyed	Detrimental
Limited	Pure
Present	Inappropriate
Appropriate	Absent

V. *Прочтите текст, найдите и переведите предложения, в которых содержатся ответы на вопросы:*

1. Where can magnesium be found in practically unlimited quantities?
2. Are there any detrimental factors in magnesium?
3. What increases the protection of all alloys?

Magnesium

The most important property of magnesium is its light weight or, in alloyed form, its high strength-to-weight ratio. Although this ratio may not be superior to that of stainless steel or strong aluminum alloys, the magnesium structure will be bulkier or thicker and, therefore, stiffer. This inherent advantage of magnesium alloys can, however, sometimes be overcome by appropriate design of aluminum or stainless-steel structures. Magnesium, a close-packed hexagonal metal, has limited ductility at room temperatures. When heated to about 500°F, it becomes very plastic and can be worked, in some cases, more severely than aluminum, brass, or steel. Finally, magnesium is the world's most universally available metal, present in sea water in practically unlimited quantities. All of the metal produced in the world up to 1949 could have been taken from one-fifth of a cubic mile of sea water!

These favorable engineering characteristics are accompanied by some detrimental factors. The metal and its alloys oxidize or burn easily when liquid or in fine particles such as machined chips or powders. In addition, the cost per pound, although steadily decreasing in the past twenty years, is still higher than most competitive metals. The cost per unit volume is not always higher, and the cost of a specific fabricated article may, in some cases, be less than that for a competitive metal.

Magnesium has long been thought to have relatively poor corrosion resistance, particularly to salt-water solutions or vapors. This resulted in extremely careful surface protection (or the abandonment of use of the metal) in many applications, *e.g.,* naval aircraft. It has been found that pure magnesium, and its important alloys are very resistant to salt-water corrosion. By keeping the amounts of iron, copper, nickel, and cobalt impurities below certain tolerance limits *(e.g.,* 0.017% Fe), or by balancing higher contents with other elements that neutralize the corrosion-stimulating effect, magnesium alloys may show far greater resistance to corrosion than was believed possible only a few years ago; *e.g.,* they withstand 3 months' alternate immersion in a 3% sodium chloride solution without significant loss of strength. This is in comparison with similar alloys made from ordinary commercial magnesium which might completely dissolve or corrode away under the same con-

ditions. Paints following a chemical dip increase the protection of all alloys, but even the improved "pure" magnesium alloys would never be chosen solely on the basis of their resistance to salt-water corrosion.

VI. *Найдите в тексте и переведите предложение, в котором встречается Subjective Infinitive Construction.*

VII. *Закончите данное предложение, выбрав фразу, отображающую одну из мыслей текста:*

The advantage of magnesium alloys can be overcome by…

1. …competitive metals.
2. …appropriate design of aluminum structures.
3. …poor corrosion resistance.

Magnesium is the world's …

1. …most competitive metal.
2. …most severely worked metal.
3. …most universally available metal.

Magnesium and its alloys oxidize easily …

1. …when heated to about 500^{o} F.
2. …when liquid or in fine particles.
3. …at room temperature.

VIII. *Найдите в тексте и назовите:*

1. *Все свойства, присущие магнезию.*
2. *Факторы, влияющие на сопротивление магнезия коррозии.*

IX. *Прочтите текст еще раз. Выразите ваше отношение к полученной информации, укажите на актуальность темы.*

X. *Изложите в письменном или устном виде:*

What is the text about?
What is described in detail?
What is given in short?
What is the key idea of the text?

XI. *Составьте аннотацию текста, используя ключевые фразы.*

UNIT 2. Zinc.

I. *Просмотрите следующие слова, они помогут вам в работе над текстом Zinc:*

To owe	быть должным
Thereafter	после этого, с того времени, соответственно
To exclude	исключать
To elevate	поднимать, повышать
Die casting	литьё под давлением, отливка матрицами
Humid	влажный
To swell	разбухать

To jam	защемлять, задерживать, не действовать
Permissible	допустимый, безопасный
To mold	формовать
Impact resistance	сопротивление удару
Shear strength	сопротивление срезу (сдвигу)
Compression strength	сопротивление сжатию
Tensile strength	сопротивление разрыву
Immerse	погружать

II. *Переведите производные:*

Protect-protection.
Permit-permission-permissible.
Paint-paintability.
Inject-injection-injector.
Select-selective-selection.
Deposit-deposition-electrodeposition.
Apply-appliance-application.
Develop-development-developing.

III. *Сгруппируйте слова близкие по значению:*

Rusting	Insure
Relatively	Mild
Provide	Comparatively
Because of	Due to
Cheap	Between grains
Humid	Corrosion
Intergranular	Decreased cost

IV. *Сгруппируйте слова противоположные по значению:*

Equal	Exclude
Result in	Increase
Liquid	Unequal
Include	Unlimited
Limited	Result from
Reduce	solid

V. *Прочтите текст, найдите и переведите предложения, в которых содержатся ответы на вопросы:*

1. What is the chief use of Zinc?
2. What do Zinc die castings provide?
3. What are the properties of Zinc?
4. How can Zinc be coated on the surface of Iron?
5. What is the melting point of Zinc?
6. What reduced the strength properties of the first die castings?

7. What is one of the strongest of die cast metals?

Zinc

This metal owes one of its chief uses to the fact that it can be coated readily on the surface of iron, by immersing the iron in liquid zinc or by electrodeposition; it will thereafter protect the iron from rusting or corrosion in mildly corrosive mediums. The protection is effected by excluding contact of the mediums with iron and is electrochemical since zinc is anodic to iron and will go into solution while iron acts as a cathode and is unaffected.

Like magnesium, zinc is close-packed hexagonal and has limited ductility at room temperature, but it becomes quite plastic at elevated temperatures. Zinc has a relatively low melting point and thus, in the alloyed form, was chosen as particularly suitable for making pressure die castings.

Zinc die castings provide long service life. They insure the painting and plating superiority. However, the first die castings proved very unsatisfactory, particularly in warm, humid climates. They would swell enough to jam mechanisms in which they were used, and the intergranular (between grains) corrosion, which caused the swelling, greatly reduced the strength properties. Research showed that by keeping the total content of lead and cadmium impurities below 0.01%, the die castings would indefinitely resist intergranular corrosion. Thus, zinc for die-casting alloys must have a purity of 99.99%, whereas that used for alloying with copper (to make brass) or for galvanizing iron has considerably higher permissible impurity limits.

Zinc is among the strongest of die cast metals. It has an impact resistance up to 45 ft. lbs. A compression strength of 60,000 psi; and a shear strength of 35,000 psi, as well as a tensile strength of 44,000 psi. None of these advantages can be matched by plastics.

Chrome plated zinc die castings are bright and attractive. They have immediate customer appeal. And they still retain their gleaming good looks year after year.

Want to add color for a contrast with plating? Zinc's superior paintability is unequaled. And the paint stays on the zinc surface.

Zinc die castings can be economically produced and finished when the latest production techniques are used to produce thin wall components. For example, thin wall zinc die castings can achieve a flatness tolerance for a 3-in. part as close as 0.008-in. Injection molded plastics cannot match this advantage.

Material selection plays a critical role in producing competitively priced quality products. Because of this, appliance designers are paying more attention than ever before to making material selection decisions.

Take the case of plastic appliance components. In some cases, they may appear to be ideally suited for an application. Plastics are often the first material a designer turns to when he thinks of cheap material and production costs. But designers sometimes forget that decreased production and materials costs can result in poor quality. And a one-time sale that can result in an anti-brand

impression. No matter what they pay for the product, consumers aren't pleased by inferior performance or service life.

For example, a product designer chooses injection molded plastic for an appliance base. It costs less than most metal. Plastic manufacturers say its production costs are low. A designer might base his material selection decision on these reasons. But he should ask himself: "How will the plastic component perform in service?"

Most uncoated plastic surfaces become scratched and unsightly after some use. Plated or painted surfaces applied to plastic can wear away in time, exposing the unattractive base material underneath. Plastic surfaces exposed to the corrosive effects of dishwashing detergents usually develop an unattractive stain that looks unsanitary.

Today's better informed appliance designers and engineers are turning to thin wall zinc die castings to solve these problems

VI. *Закончите данное предложение, выбрав фразу, отображающую одну из мыслей текста:*

Zinc owes one of its chief uses to the fact that …

1. …it can be coated readily on the surface of iron.
2. …it provides long service life.
3. …it is closed-packed hexagonal.

Zinc will protect the iron from rusting …

1. …at room temperature.
2. …at elevated temperature.
3. …in mildly corrosive mediums.

The first die castings proved …

1. …painting superiority of Zinc.
2. …very unsatisfactory.
3. …quality isn’t sacrificed.

Zinc for die casting alloys must have …

1. …impurities below 0.01%.
2. ...a purity of 99.99%.
3. ...higher permissible impurity limits.

VII. *Просмотрите первый абзац текста и озаглавьте его. Найдите предложение, описывающее физический смысл электролитического выделения металла, переведите его.*

VIII. *Письменно переведите третий абзац текста.*

IX. *Докажите, что цинк – один из наиболее подходящих для литья под давлением металлов.*

X. *Найдите абзац, в котором говорится о превосходстве отливок цинка под давлением над пластмассой, заформованной впрыскиванием.*

XI. *Составьте аннотацию текста, используя ключевые фразы.*

UNIT 3. Iron.

I. *Просмотрите следующие слова, они помогут вам в работе над текстом Iron.*

Ingot	слиток, болванка
Enameled ware	эмалированные изделия
To subject	подвергать
Embrittlement	хрупкость, придание хрупкости
To pickle	травить, протравливать
To electroplate	наносить слой металла гальваническим способом
Interstice	промежуток
Relatively	связанно, родственный
Constituent	составная часть
Hot-shortness	красноломкость
Innocuous	безвредный
Eddy-current loss	потеря из – за токов Фуко
Permeability	проницаемость, проходимость

II. *Переведите производные:*

Relate-relative-relatively.
Brittle-embrittle-embrittlement.
Differ-different-difference.
Free- freely-freedom.
Continue-continuity-discontinuity.
Tense-intense-intensity.

III. *Сгруппируйте слова близкие по значению:*

Sufficiently	Sample
Specimen	Permit
Entirely	Quantity
Attain	Transform
Allow	Obtain
Convert	Totally
Amount	Enough

IV. *Сгруппируйте слова противоположные по значению:*

Stable	External
Result in	Forbid
Desirable	Unstable
Purity	Undesirable
Internal	Impurity
permit	Result from

V. *Прочтите текст, найдите и переведите предложения, в которых содержатся ответы на вопросы:*

Where does ingot iron find its application?

What is the difference between hydrogen embrittlement of copper and iron?

What is the effect of the presence of manganese sulfide on the steel?

How can eddy-current losses be prevented?

Iron

In the pure state, iron has much better corrosion resistance than in the relatively impure form of steel, even low-carbon grades. Ingot iron finds its most important applications in enameled ware and in fields-where better corrosion resistance than that of steel, but not particularly high strength, is required.

Iron is subjected to a "hydrogen embrittlement," which is entirely different in nature from the hydrogen embrittlement of copper. Whereas copper is embrittled only when it contains oxygen (or oxide) and is heated in hydrogen, iron is embrittled even though free of oxygen and kept at room temperatures. If the iron is at room temperatures, hydrogen is absorbed in sufficiently large quantities only when the gas is present at the surface in atomic form. Thus hydrogen kept in steel cylinders does not particularly embrittle the steel. However, if iron or steel is pickled in acid or electroplated, hydrogen is released in the atomic form at the metal surface and is absorbed readily by the iron. Hydrogen atoms can move freely through interstices of the iron's atomic structure. When a sufficient number come to some internal discontinuity, they tend to join up in pairs to form stable H_2 molecules and, in so doing, create a local pressure that can attain extremely high intensities. A specimen in this condition is very brittle and, relatively, weak. The same hydrogen embrittlement will result from heating iron or steel in hydrogen or from hydrogen absorbed by molten iron, in the case of certain grades of steels. Following the absorption of hydrogen, a long time at room temperature or shorter time at somewhat elevated temperatures will permit it to diffuse to the surface and escape there. This will result in regaining practically all of the original ductility of the metal.

The commonest undesirable impurity element in all iron and steels is sulfur which, with iron, forms a low-melting-point constituent and thus causes hot-shortness. The presence of manganese in amounts of about five times the sulfur

content converts the sulfur to innocuous (high-melting-point), manganese sulfide. When present in comparatively large amounts, the manganese sulfide, by interrupting the continuity of the plastic ferrite matrix, permits the steel to be machined faster, with less power, and with a better surface finish. Sulfur added to oxidized liquid steels of normal content does not seem to form the normal iron sulfide that, distributed along grain boundaries, causes hot-shortness. Ramsey and Graper show that the machinability of deoxidized steels may be improved without large manganese additions by adding sulfur as a sulfite, Na_2SO_3, which, upon contact with liquid steels, decomposes to SO_2 and Na_2O. The SO_2 is absorbed by the steel, perhaps as a monoxide with the excess oxygen forming SiO_2 and Al_2O_3. These are slagged off by the Na_2O. The resulting oxysulfide inclusions, by being uniformly dispersed, increase machinability without causing hot-shortness. However, other authorities claim that the same slight increase in sulfur, added directly as sulfur rather than as sulfite, would have a comparable favorable influence on machinability.

Iron is the most strongly magnetic of all the elements, yet it is not used in the pure form in electromagnets or in permanent magnets. In electromagnets, it is too good an electrical conductor. To prevent high eddy-current losses, silicon in amounts of about 3.5% is added to reduce conductivity with little effect on magnetic permeability. Permanent magnets require characteristics that are found to the highest degree in hard alloys of iron with cobalt, aluminum, and other elements.

VI. *Закончите данное предложение, выбрав фразу, отображающую одну из мыслей текста:*

Hydrogen kept in steel cylinders…

1. …doesn't particularly embrittle the steel.
2. …is absorbed readily by the metal.
3. …is released in the atomic form at the metal surface.

Hydrogen atoms can…

1. …be absorbed by molten iron.
2. …be present in large amount.
3. …move freely through interstices.

Sulfur added to oxidized liquid steels does not seem…

1. …to form the normal iron sulfide.

2. …to contact with liquid steels.
3. …to increase machinability.

VII. Перечислите все свойства железа, рассматриваемые в тексте.

VIII. Прочтите текст еще раз. Выразите ваше отношение к полученной информации, укажите на актуальность темы.

IX. Изложите в письменном или устном виде:

What is the text about?
What is described in detail?
What is given in short?
What is the key idea of the text?

X. Составьте аннотацию текста, используя ключевые фразы.

UNIT 4. **Aluminum**.

I. Просмотрите следующие слова,они помогут вам понять текст Aluminum

Volume basis	
Weight basis	
Constituent	составляющая
Span	перекрытие, пролет
Utensil	кухонная посуда
To favor	поддерживать

II. С помощью отрицательных преффиксов образуйте слова, противоположные по значению данным; переведите их.

Un – important, detectable, easy, limited, desirable, available, affected, satisfactory.
In – soluble, definitely, sufficiently, dependent, tensity.
Ab – normal.
Im – purity, movable, perfect.
Non – toxic, conductive, corroding, directional, ferrous, soluble.

III. Сгруппируйте слова близкие по значению:

Application	Enough
Amount	Sphere
Decrease	Quantity
Sufficiently	Enlarge
Field	Usage
increase	Reduce

IV. *Сгруппируйте слова противоположные по значению:*

Light	Result from
Solid	Unimportant
Conductor	Liquid
Present	Insulator
Result in	Heavy
important	Absent

V. *Просмотрите текст, найдите и переведите предложения с прилагательными в сравнительной степени.*

Aluminum

This light metal is slightly stronger and less ductile when the normal content of iron, silicon, and copper impurities are present (as in Alcoa 2S), but in most alloy applications these are relatively unimportant. They have some influence on alloy casting properties and heat treatment temperatures, and the amounts present should be controlled for reproducible optimum properties.

Aluminum has an electrical conductivity about two-thirds that of copper on a volume basis; it is a better conductor on a weight basis since it weighs only about one-third as much as copper. Since the iron and silicon impurities form constituents that are insoluble in solid aluminum and do not materially reduce conductivity, commercially pure aluminum is becoming widely used for long-distance high-voltage power transmission lines. Aluminum wires surround a steel wire, present to increase strength, and the assembly is sufficiently light to increase spans between supporting towers and materially reduce line installation costs.

The corresponding high thermal conductivity, together with cold plasticity that permits easy working, has resulted in aluminum becoming the standard material for cooking utensils. Of course, the good corrosion resistance of the metal and the

nontoxic character of salts'formed by any aluminum that does dissolve also have favored this field of application of the metal.

VI. *Просмотрите §1 и расскажите о влиянии примеси железа, кремния и меди на свойства алюминия.*

VII. *В §2 найдите ответы на вопросы:*

1. What properties of aluminium are mentioned there?
2. What are the fields of aluminium application?

VIII. *Перечислите все свойства, позволяющие использовать алюминий для изготовления кухонных принадлежностей.*

IX. *Составьте аннотацию к тексту.*

UNIT 5. **Nickel.**

I. *Просмотрите следующие слова, они помогут вам в работе над текстом Nickel:*

To embrittle	придавать хрупкость
Innocuous	безвредный
To escape	вырываться, просачиваться, улетучиваться
Extent	степень
To rust	ржаветь
To deposit	осаждать, покрывать
Melting furnace	плавильная печь
Grain boundary	граница зерна

II. *Переведите следующие слова:*

Form – to form, use – to use, display – to display,present – to present, escape – to escape, cost – to cost, limit – to limit, cover – to cover,rust – to rust.

III. *Сгруппируйте слова близкие по значению:*

Slight	Show
Entire	Often
Permint	Whole
Display	Allow
frequently	Little

IV. *Сгруппируйте слова противоположные по значению:*

Thin	Absent
Major	Undetectable
Pure	Intermittent
Detectable	Thick
Present	Impure
continuous	minor

V. Прочтите текст и найдите предложение, в котором говорится об отличии никеля от всех вышеупомянутых металлов.

Nickel

The element in commercially pure form may contain a slight amount of sulfur from the fuel used in melting furnaces, which may form a continuous envelope of brittle sulfide at the grain boundaries and thus embrittle the entire structure. The amount of sulfide can be so small as to be undctectable by ordinary micrographic technique. The addition of about 0.05% Mg causes sulfide to form in an innocuous dispersion of particles and permits the metal to display its inherent plasticity or malleability. Similarly, lead may be present as an impurity in gold in amounts small enough to escape detection by the microscope and yet form a thin brittle envelope at grain boundaries, which, being continuous or nearly so, embrittles the entire structure.

Nickel is the most expensive metal of those discussed so far, and its relatively high cost has limited its uses to some extent. Its very good resistance to corrosion is most often utilized by electroplating a thin layer on the base metal or on an intermediate copper plate. The nickel plate is most frequently covered with a very thin layer of chromium electroplate, the chromium being harder, brighter, and therefore more pleasing to the eye. However, the corrosion protection depends on the nickel, since the chromium deposits are always somewhat porous. When the so-called *chrome plate* on an automobile begins to rust, it is generally because too thin a layer of nickel was deposited underneath the chromium.

The electrical and electronic industries depend on nickel for various components of vacuum tubes; its electron emission and expansion (for sealing in glass) characteristics are important here. Nickel is also important as a catalyst in certain

chemical industries. However, the major uses of nickel are as an alloying element, particularly in steels.

VI. *Найдите в тексте и переведите предложения, в которых встречаются Objective Infinitive Construction, Absolute Participial Construction.*

VII. *Закончите данное предложение, выбрав фразу, отображающую одну из мыслей текста:*

Nickel in commercially pure form may contain…
1. …gold in small enough amounts.
2. …an alloying element.
3. …a slight amount of sulfur.

Lead may be present in gold in small enough amounts…
1. …to begin to rust.
2. …to limit its use.
3. …to escape detection by the microscope.

Electrical and electronic industries depend on …
1. …alloying elements.
2. …various components of vacuum tubes.
3. …nickel.

VIII. *Ответьте на вопросы:*

1. What impurities may be present in commercially pure nickel?
2. What has limited nickel uses?
3. What properties of nickel are most often utilised?
4. What are the fields of nickel application?

IX. *Составьте аннотацию текста.*

UNIT 6. **Beryllium**

I. *Просмотрите следующие слова, они помогут вам в работе над текстом Beryllium:*

Hot-rolled	горячекатанный
Film	пленка, слой
Deficient	отсутствующий, недостающий
Hot-short	красноломкий
Bismuth	висмут Bi
Transparent	прозрачный
Opaque	непрозрачный
Apart from smth	кроме
Constituen	составляющая

II. *Переведите глаголы, соответствующие прилагательным:*

Free – свободный	To free
Lower – нижний	To lower
Slow – медленный	To slow
But – но	To but
Busy – занятый	To busy
Round - круглый	To round

III. *Образуйте терминологические словосочетания:*

Brittle	Tube
Gaseous	Boundary
Power	Element
Inherent	Impurities
Grain	Metal
Expensive	Malleability
Corrosion	Plants
Vacuum	Protection
Alloying	

IV. *Переведите словосочетания:*

crystal structure, remelted under a vacuum, cast under vacuum, stable oxide particles, beryllium oxide film, cold malleability, low atomic number, transparent to X-rays, opaque to air, alloying constituent.

V. *Прочтите текст и найдите ответы на вопросы:*

1. Why has Beryllium always been considered as a brittle metal?
2. With what metals can Beryllium be alloyed?
3. What are the fields of its application?

Beryllium

Although having the same type of crystal structure as zinc and magnesium, beryllium has always been considered as a brittle metal since the purest laboratory grades have shown no malleability. Recently, commercial beryllium remelted under a vacuum (to eliminate nitrogen and other gaseous impurities), alloyed with small amounts (0.2 to 0.5%) of titanium or zirconium, and then cast under vacuum,

has been successfully hot-rolled.' The titanium or zirconium seems to form disperse stable oxide particles which replace the former beryllium oxide films that initiated cracking. However, the hot-worked product is still deficient in cold malleability. Improvement in this direction would greatly increase the utility of this interesting metal. It is probable that small amounts of aluminum or other similar metals, by forming a low-melting phase, can make the metal hot-short in a manner similar to sulfur in iron or nickel, lead in gold, or bismuth in copper.

The only significant use of beryllium as a metal is as a window in X-ray tubes, and it was for this application that a method of hot-rolling beryllium was developed. Beryllium, with a very low atomic number, is quite transparent to X-rays and at the same time opaque to air so that a vacuum can be maintained within the tube and X-rays are passed through the window with little loss in intensity. Apart from this, the metal is used in small amounts as an alloying constituent, particularly in copper. It may also become important in nuclear power plants.

VI. *Найдите в тексте и переведите предложение, содержащееSubjective Infinitive Construction.*

VII. *Выпишите все свойства бериллия, упомянутые в тексте.*

VIII. *Закончите предложения в соответствии с содержанием текста:*

The only significant use of beryllium is …
1. …as a metal.
2. …as a window in X-ray tubes.
3. …in nuclear power plants.

Although having the same type of crystal structure as zinc, beryllium is …
1. …as brittle as zinc.
2. …more brittle than zinc.
3. …the most brittle metal.

To eliminate gaseous impurities commercial beryllium is ….
1. …cast under vacuum.
2. …remelted under a vacuum.
3. …alloyed with small amounts of titanium.

IX. *Составьте аннотацию к тексту.*

UNIT 7. **Material selection for hard coatings**

I. *Просмотрите следующие слова, они помогут вам в работе над текстом Material selection for hard coatings:*

Versatile разносторонний, изменчивый

Interface	поверхность раздела
Adherence	сцепление, прилипание
Strain	деформация, напряжение, механическое воздействие
Misfit	несоответствие
Concomitant	сопутствующий
Constitution	состав, строение
Fabrication	производство, изготовление
Bond	связь
Means	средства

II. Сгруппируйте слова близкие по значению:

Interrelation	At once
Obtain	Characteristics
Performance	Achieve
Tremendous	Every
Important	Great
Simultaneously	Main
each	Reaction

III. Сгруппируйте слова противоположные по значению:

Increasing	Reject
Advantages	Decreasing
Complex	Different
Similar	Simple
Accept	Disadvantages

IV. Прочтите и переведите название текста.

V. Просмотрите текст, определите, о чем идет речь: о каком явлении, проблеме, процессе.

Material selection for hard coatings

The protection of materials by hard coatings is one of the most important and versatile means of improving component performance. We know of a tremendous number of hard materials and therefore it is important to have criteria for the selection of the most suitable coating material for specific needs. This is not easy because the requirements for the composite substrate/layer are often very complex and many compromises must be accepted.

One has to distinguish three different zones, each having different property requirements. First is the *substrate interface* where adherence, interaction (reaction) of the substrate with the layer, and strains by thermal expansion misfit are critical points. Second, we have the *layer material* where composition and

microstructure determine properties such as hardness, strength, internal stress, fracture toughness, thermal stability, or thermal conductivity. Finally, the *layer surface* where the interaction tendency of the layer material with a work piece or with the environment has to be considered.

Problems with the material selection arise mainly because many desired properties such as good adherence at the substrate-layer interface and no surface interactions, or high hardness and high toughness of the layer cannot be obtained simultaneously. Increasing hardness and strength are concomitant with decreasing toughness and adherence.

The main factors which determine coating material properties are *constitution* of the material system, and *the fabrication parameters.* Both of these determine the *microstructure* of the coating. Up to now only the influence of fabrication parameters on microstructure and properties were investigated.

Hard materials for coatings can be divided in three groups dependent on the chemical bonding character: *metallic* hard materials (borides, carbides, and nitrides of the transition metals), *covalent* hard materials (borides, carbides, and nitrides of Al, Si, and B, as well as diamond), and *ionic* (ceramic) hard materials (oxides of Al, Zr, Ti, and Be).

Comparing these hard material groups one can make the following statements:

(1) Each of the different groups of hard materials show advantages and disadvantages in respect of an application as hard coating.

(2) The metallic hard materials seem to be the most suitable and versatile layers substances.

(3) Ionic (ceramic) hard materials are suitable, in particular, for the surface because of high stability and low interaction tendency.

(4) Optimum wear resistance can only be achieved by multiphase or multilayer coatings.

VI. Выбирите правильный ответ в соответствии с содержанием текста:

The selection of the most suitable coating material is very difficult because the requirements for the composite substrate/layer are very complex.

a) it's right; b) it's wrong; c) it's not mentioned in the text.

Problems with the material selection arise mainly because many desired properties cannot be obtained simultaneously.

a) it's right; b) it's wrong; c) it's not mentioned in the text.

Hard materials for coating can be divided into two groups.

a) it's right; b) it's wrong; c) it's not mentioned in the text.

Each group of hard materials has its advantages.
a) it's right; b) it's wrong; c) it's not mentioned in the text.

VII. *Найдите в тексте и переведите предложения с эквивалентами модального глагола (2) и Subjunctive Infinitive Construction.*

VIII. *Перечислите : а) 3 зоны, определяющие критерий выбора материала для покрытия; б) основные свойства, влияющие на выбор материала для покрытия; в) 3 группы твердых материалов.*

IX. *Выразите ваше отношение к полученной информации,укажите на новизну и актуальность темы.*

X. *Просмотрите текст еще раз и ответьте на следующие вопросы:*

1. What does the text deal with?
2. What is described in detail?
3. What is considered briefly?
4. What is the key idea of the text?

XI. *Составьте описательную аннотацию на русском и английском языках на базе полученных ответов на вопросы.*

Unit 8. **Multilayer and two- or multiphase coatings**

I. *Просмотрите следующие слова, они помогут вам в работе над текстом Multilayer and two- or multiphase coatings:*

Bulk	большая часть
Coherent	связный, сцепленный
Interface	поверхность раздела
Consequence	следствие
Mutual	взаимный
To be responsible for	быть ответственным за
Bit	сверло, лезвие инструмента
To restrict	ограничивать
Available	доступный, имеющийся в распоряжении
Dissipation	рассеяние

II. *Замените выделенные слова синонимами:*

An outer layer reduces friction.
Multilayer coatings seem to be the best.
Tool bits coated with multilayers show much better performance.
Coherent interfaces are formed if some conditions are fulfilled.
Metallic hard materials are able to form coherent interfaces with metals.

Multiphase, covered, can, decreases, characteristics, requirements are met.

III. *Прочтите и переведите слова, объясните значения преффиксов и суффиксов:*

Multi - multilayer, multichannel, multiphase, multiangular, multianode, multicolour, multielectrode,multiform.

Semi – semiconductor, semisolid, semicoherent, semicircle, semifluid, semilustrous, semiperiod, semiprecious, semirigid.

Inter – interface, interaction, intermediate, interatomic, interchange, interconnection.

-less- stainless, useless, limitless, weightless.

IV. *Прочтите текст, выделите главную мысль каждого абзаца.*

Multilayer and two- or multiphase coatings

Because of complex requirements such as hardness and toughness, weak adhesion at the surface, and at the same time, good adherence at the substrate-layer boundary, multilayer coatings or multiphase coatings seem to be the best compromise. For these multiphase or multilayer coatings it is necessary to analyze the constitution of interfaces in hard material systems. Results on bulk material suggest three different possibilities. Coherent or partially coherent interfaces with a "boundary phase" and interaction free interfaces. Metallic hard materials are able to form coherent or semicoherent interfaces with metals or other metallic hard materials. As a result low-energy interfaces with optimum adherence can be obtained (e.g., TiC/TiB_2). Interfaces between metallic and ionic hard materials often show intermediate regions of variable composition (e.g., TiC/Al_2O_3). The behavior is strongly dependent on the constitution and structure of this boundary phase. Interfaces between covalent hard materials seems to be quasi-interaction-free with the consequence of bad adherence of the phases (e.g., B_4C/B_4C or B_4C/Al_20_3).

The multilayer concept is already very common in the coating technology. Layered materials are used with mutual solubility, like TiC and TiN, Al_2O_3 and AlN or with coherent interfaces (TiC or TiN and TiB_2) to get sufficient bonding between the layers.

Considering the special characteristics of the different hard materials, it is possible to construct coatings where the inner layer provides good adherence to the substrate, where one or more intermediate layers are responsible for hardness and strength and where an outer layer reduces friction, adhesion, and reactivity.

Tool bits coated with multilayers show much better performance than most of the one layer coated materials. Developing multilayer coatings requires one to

insure a sufficient interface adherence between the layers. This can restrict the material available for selection.

Another promising concept is a two- or multiphase coating with a high amount of favorable, low-energy interfaces, suitable for energy dissipation in the layer. The phases forming the layer have to be selected so that coherency is possible at the interfaces. Carbides and nitrides of the transition metals with the transition metal diborides are combinations forming coherent interfaces if some preconditions concerning the atomic distances are fulfilled. This is possible, for instance, with the two phases TiC and TiB_2. By simultaneous magnetron sputtering from a TiC/TiB_2 cathode or by sequential sputtering from a TiC and TiB; cathode, nanodispersed TiC/TiB_2 layers can be obtained with up to 500 coherent layers or interfaces in a *5*-mm coating.

The important role of interfaces for the wear behavior also becomes evident when one performs abrasion tests with one phase material and two (or multiphase) bulk materials. High abrasion resistance is not only due to high hardness. For example, B_4C is the material with the highest hardness, whereas a B_4C containing composite material with lower hardness has a three times better abrasion resistance. It is also due to the ability of the material to reduce internal stresses. This concept should also work in layered coatings and seems to be most promising for future developments.

V. *Ответьте на вопросы:*

1. What concept is very common in the coating technology?
2. Why do multilayer coatings seem to be the best compromise?
3. What coatings is it possible to construct?
4. What restricts the material selection for multilayer coatings?
5. What is obtained as a result of reaction of metallic hard materials with metals or other metallic hard materials?
6. What does the behavior of interfaces between metallic and ionic hard materials depend upon?
7. What are the reasons of high abrasion resistance?

VI. *Прочтите текст еще раз. Выразите ваше отношение к полученной информации, укажите на актуальность темы.*

VII. *Изложите в письменном или устном виде:*

What is the text about?
What is described in detail?
What is given in short?
What is the key idea of the text?

VIII. *Составьте описательную аннотацию на базе полученных ответов на вопросы.*

UNIT 9. **Optimizing properties of hard materials.**

I. *Просмотрите следующие слова, они помогут вам в работе над текстом:*

Applicable	пригодный, подходящий
Ternary	тройной, трёхкомпонентный
Refractory	тугоплавкий, огнестойкий
Wetting angle	угол смачивания
Homogeneity	однородность
Range	ряд, серия, колебаться
Rupture strength	сопротивление разрыву
Adjustment	регулирование, пригонка
Profound	глубокий, основательный

II. *Сгруппируйте слова близкие по значению:*

Significance	Characteristics
Fundamental	As a result
Property	Importance
Limitation	Shortcoming
As a consequence	Principal

III. *Сгруппируйте слова противоположные по значению:*

Singlelayer	Disadvantage
Fixed	Narrow
Metal	Multylayer
Increase	Nonmetal
Advantage	Decrease
wide	Variable

IV. *Просмотрите текст, найдите и переведите предложения, являющиеся ответом на вопросы:*

What are the topics of consideration in this text?

What is responsible for the properties in metalic hard materials?

Optimizing properties of hard materials.

Because of the advantages and the significance of metallic hard materials for single- or multilayer coatings, fundamental relationships, which are applicable for the selection of coating materials with specific properties will now be discussed. Characteristics of specific binary carbides, the variable stoichiometry,

transformations, anisotropy, specific properties of borides, carbides, and nitrides, and ternary and quaternary systems, are topics for consideration in this regard.

In metallic hard materials metallic bonding as well as localized metal-nonmetal bonds are responsible for the properties. The amount of metallic bonding increases going from the fourth group to the sixth group transition metal carbides. TiC and WC represent the limitation of this changing bonding character of refractory carbides (TiC-highest, WC-lowest amount of directed M-C bonding). As a consequence, depending on the group number of the carbide forming transition metals, property changes are observed.Proceeding from group IV to group VI transition metal carbide one gets a decrease of room-temperature hardness, an increase of hot hardness, an increase of fracture toughness, a decrease of the wetting angle with Fe, Co, Ni, and an increase of solubility in Fe, Co, and Ni.

The greatest advantage of coating materials is the high room-temperature hardness and the small interaction tendency with other materials, especially steels, but a relatively high brittleness has to be accepted. The greatest disadvantage of coating materials showing much better fracture toughness, is the higher reaction tendency with other materials, especially steels.

The metallic hard materials, in particular, the carbide and nitrides have wide homogeneity ranges, for Ti-C, Ti-N, and to less amount for Ti-B. This causes profound property changes, demonstrated here for hardness and for hardness and transverse rupture strength of TaC_{1-x} which can be measured for different compositions. The adjustment of a fixed nonmetal-to-metal ratio allows one therefore to control many properties.

V. *Выбирите правильный ответ в соответствии с содержанием текста:*

1. The amount of metalic bonding increases going from the fourth group to the sixth group transition metal carbides.

a) it’s right; b) it’s wrong; c) it’s not mentioned in the text.

2. Properties do not change with the change of the group number of the carbide forming transition metals.

a) it’s right; b) it’s wrong; c) it’s not mentioned in the text.

3. The greatest advantage of coating materials is their high brittleness.

a) it’s right; b) it’s wrong; c) it’s not mentioned in the text.

4. Nitrides have wide homogeneity ranges for Ti-C.

a) it’s right; b) it’s wrong; c) it’s not mentioned in the text.

5. Temperature-dependent phase bounderies can be used to strengthen material.

a) it’s right; b) it’s wrong; c) it’s not mentioned in the text.

VI. *Прочтите текст еще раз. Выразите ваше отношение к полученной информации, укажите на актуальность темы.*

VII. *Изложите в письменном или устном виде:*

What is the text about?
What is described in detail?
What is given in short?
What is the key idea of the text?

VIII. *Составьте описательную аннотацию на базе полученных ответов на вопросы*

UNIT 10. **Casteutectic alloys: lead – basesystems.**

I. *Просмотрите следующие слова, они помогут вам в работе над текстом:*

To meet requirement	отвечать требованию
Solubility	растворимость
Lattice	кристаллическая решетка
Originate in	происходить, возникать
Eutectic	эвтектический
To exhibite	проявлять, обнаруживать
Stable	устойчивый, прочный
Age – hardening	твердение при старение
Polishing	полировка, отделка начисто
Specimen	образец
Emery paper	наждачная бумага
Smear	смазывать

II. *Назовите первую форму следующих прилагательных в сравнительной степени:*

Less, more, further.

III. *Сгруппируйте слова близкие по значению:*

Readily	Often
Frequently	Important
To apply	Several
Some	Easily
Significant	To etch
Requirement	Demand
To Show	To exhibite
To pickle	To use

IV. *Сгруппируйте слова противоположные по значению:*

Different	Unstable
Possible	Liquid
Constant	Similar
Definite	Rise
Melt	Impossible
Solid	Freeze
Stable	Indefinite
Fall	Changeable

V. *Прочтите и переведите название текста.*

VI. *Проосмотрите текст, определите, о чем идет речь: о каком явлении, проблеме, процессе.*

Casteutectic alloys: lead – basesystems.

There are at least two requirements that must be met for an alloy system to show complete solid solubility: (1) The two metals must have atomic lattices of the same type; e.g., both should be face-centered cubic or body-centered cubic. (2) The two atoms must be of nearly the same size. In the Cu:Ni and Au:Ag solutions, copper and nickel atoms differ in size by less than 3%; gold and silver atoms differ by less than 1%; and all four of these metals have face-centered cubic lattices. If the component metals of an alloy system do not meet the requirement of similar lattice types, complete liquid solubility is, of course, possible, but the alloy system must show .two solid phases. These frequently originate in a reaction known as a eutectic from the Greek word *eutectic* meaning "well-melting", since the eutectic alloy (11.1% Sb) melts at a constant temperature. It has been logical, then, to apply the Greek prefix *hypo-,* meaning "less than," to alloys having less than the eutectic concentration of an alloying element and more than the solid-solution limit (here, 3.5 to 11.1% Sb), and to use the prefix *hyper-,* meaning "more than," to alloys to the right of the eutectic (here, 11.1 to about 97% Sb).

For many years, eutectics were thought to be definite chemical com-pounds since they froze at a constant temperature and exhibited fixed concentrations, i.e., in this case, Pb + 11.1% Sb.

The metal lead forms eutectic systems with several other metals. The industrially significant systems to be discussed here'are Pb:Sb, Pb:Sn, and Pb:Sn:Sb.

Lead - base alloys are so soft that plastic flow readily occurs during polishing. This makes it sometimes difficult to prepare specimens for examination. It is necessary to lubricate the emery papers with a solution of paraffin dissolved in kerosene to prevent particles of lead or tin from adhering to the paper and subsequently causing smearing and distortion of the surface layers. Wet polishing is done in the normal way but, if a black smudge appears on the surface, the cloth must be kept wet with alumina and soap and polishing must be continued until the surface appears bright.

A microtome may be used if it is sufficiently rigid and the knife maintained sharp and smooth. The instrument should be capable of removing a layer only 2 microns thick. With proper handling, the microtomed surface may be etched directly for immediate examination with no further polishing.

VII. *Выбирите правильный ответ в соответствии с содержанием текста:*

An alloy system must meet at least 2 requirements to show complete solid solubility.

a) it’s right; b) it’s wrong; c) it’s not mentioned in the text.

In the Cu:Ni solution copper and nickel atoms are of nearly the same size.

a) it’s right; b) it’s wrong; c) it’s not mentioned in the text.

If the component metals of an alloy system do not meet the requirement of similar lattice types complete liquid solubility is impossible.

a) it’s right; b) it’s wrong; c) it’s not mentioned in the text.

Hypoeutectic alloys have less than the eutectic concentration of an alloying element.

a) it’s right; b) it’s wrong; c) it’s not mentioned in the text.

Eutectics are definite chemical compounds.

a) it’s right; b) it’s wrong; c) it’s not mentioned in the text.

With proper handling, the microtomed surface needs no further polishing.

a) it’s right; b) it’s wrong; c) it’s not mentioned in the text.

VIII. *Назовите два требования, которые должны выполняться, чтобы легирующие системы были полностью растворимы в тредом состоянии.*

IX. *Дайте определение эвтектической системы.*

X. *Перечислите самые важные эвтектические системы.*

XI. *Выпишите все свойства эвтектических сплавов на основе свинца, упомянутые в тексте.*

XII. *Прочтите текст еще раз. Выразите ваше отношение к полученной информации, укажите на актуальность темы.*

XIII. *Изложите в письменном или устном виде:*

What is the text about?
What is described in detail?
What is given in short?
What is the key idea of the text?

XIV. *Составьте описательную аннотацию на базе полученных ответов на вопросы.*

UNIT 11. **Characteristic Properties of Eutectic System Alloys.**

I. *Просмотрите следующие слова, они помогут вам в работе над текстом:*

Eutectiferous	доэвтектический
Antimony	сурьма Sb
Diminution	уменьшение
Inflection	сгиб, изгиб
Plot	диаграмма, график
Dendrite	дендрит
Duplex structure	двойная структура
Vica versa	наоборот
Consideration	соображение
On the other hand	с другой стороны

II. *Сгруппируйте слова близкие по значению:*

Decrease	Whole
Fine	Speed
Considerable	Dimenution
Amount	Quick
Rapid	Quantity
Rate	Large
Especially	Small
Entire	Particularly

III. *Переведите производные:*

Eutectic – eutectiferous – hypoeutectic – hypereutectic
Solid – solidify – solidification
Correspond – corresponding
Concentrate – concentration
Consider – consideration - considerable

IV. *Сгруппируйте слова противоположные по значению:*

Increase	Farther
Finer	Latter
Present	Hard
Weak	Result from
Former	Diminution
Closer	Larger
Result in	Absent

V. *Прочтите и переведите название текста.*
VI. *Проосмотрите текст, определите, о чем идет речь: о каком явлении, проблеме, процессе.*

Characteristic Properties of Eutectic System Alloys

The properties of a series of alloys across a eutectic horizontal will naturally be a function of the two solid phases present. In the Pb:Sb system and in a majority of all commercially important eutectiferous alloys, one phase is relatively weak and plastic, the other relatively hard and brittle. As the antimony content is increased from 3 to about 97%, the proportionate amount of $\alpha_{(Sb)}$ crystallites increases linearly, but the strength does not increase in the same way because of the difference in dispersion or size of the $\alpha_{(Sb)}$ solid-solution crystals, depending on whether they are primary or eutectiferous. There is a rapid rate of increase in strength from 3 to 11%, and a diminution from 11 to 97% Sb. In the former range, fine, eutectiferous crystallites of $\alpha_{(Sb)}$ are increasing in amount; in the latter range, the amount of small particles (or the amount of eutectic) is decreasing, with a corresponding increase in the number and size of large primary crystallites of antimony. The result is an inflection at the eutectic point in the plot of any mechanical property against alloy concentration across a eutectic series; in fact, it may be not only an inflection but a maximum, particularly of strength.

Examination of the microstructures shows that in all hypo- and hypereutectic alloys, the eutectic structure is continuous, as would be expected since, during freezing, eutectic liquid surrounds the primary dendrites. If in the eutectic structure the plastic phase is continuous as in the Pb:ll.l% Sb alloy, then the entire series of alloys must have some plasticity. If, on the other hand, the brittle phase is continuous as in Al:Cu alloys, the entire series will be brittle. It seems to be generally true that, if one phase is present in a considerably greater proportion in the eutectic, it will be continuous in .the duplex structure. Thus, if the eutectic concentration is much closer to that of a plastic phase, the eutectic generally will be plastic, and vice versa.

In addition to these considerations, an increase in cooling rates during solidification generally will result in smaller primary dendrites, a finer particle size (and perhaps different shape) in the eutectic, and perhaps a greater amount of eutectic. These factors may influence mechanical properties of eutectic alloys to a very considerable degree.

VII. *Найдите в тексте и переведите предложения, содержащие ответ на вопрос:*

1) What do the properties of eutectic alloys depend upon?
2) Why is the eutectic structure continuous in all hypo- and hypereutectic alloys?
3) What does an encrease in cooling rates during solidification in the eutectic result in?

VIII. *Закончите данное предложение, выбрав фразу, отображающую одну из мыслей текста:*

In a majority of commercially important eutectiferrous alloys …

1. …one phase is relatively weak and plastic.
2. …one phase is relatively hard and brittle.
3. …there is a rapid increase in strength.

If the eutectic concentration is closer to that of a plastic phase …

1. …the eutectic generally will be plastic.
2. …it will be continuous in the duplex structure.
3. …the entire series will be brittle.

The properties of eutectic alloys are a function of …

1. …the two solid phases present.
2. …the relatively weak and plastic phase.
3. …the antimony content.

IX. *Прочтите текст еще раз. Выразите ваше отношение к полученной информации, укажите на актуальность темы.*

X. *Изложите в письменном или устном виде:*

What is the text about?
What is described in detail?
What is given in short?
What is the key idea of the text?

XI. *Составьте описательную аннотацию на базе полученных ответов на вопросы.*