

PRODUCTS OF POWDER METALLURGY

1. Cutting materials



Alloyed carbides

Cutting plates are produced from alloyed carbides. They are **solidly** attached to cutting tools by **soldering** or **gluing** or they are designed to be exchanged. They are **clamped** using special **clamps**. Alloyed carbides **stand out** for their high **abrasive resistance**, **durability** and they can stand temperatures around 900 to 1 000° C.



Types of alloyed carbides:

- K** – they are used for materials, which make short small **chips**, for example, cast iron and some plastics.
Chemical composition of an alloyed carbide type K: $WC + Co$. The plates are marked with the colour red.
- P** – the most often used kind of alloyed carbide, which is used for machining steels, which make **fluent chips**.
The chemical composition of an alloyed carbide type P: $WC + TiC + Co$. The plates are marked with the colour blue.
- M** - an alloyed carbide used for machining **tough** corrosion-resistant and austenite steels.
The chemical composition of an alloyed carbide type M: $WC + TiC + TaC + Co$. The plates are marked with the colour yellow.

Individual companies adjust the chemical composition of its alloyed carbides according to their own standards.

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Most cutting tools today are coated for increasing **durability** and resistance against temperature. The coats are **single-layered** or **multi-layered**. They are most often made of Al_2O_3 , TiC, TiN, and other elements.

Cutting ceramics



Cutting ceramic material stands out for its high temperature resistance – it can stand up to 1 300 °C, its cutting properties and **durability**. A disadvantage is its **brittleness** and tendency to **crack** during **sudden** changes of temperature. Ceramic materials, whose base is silicon nitride, remove these **insufficiencies**. The most common plates have a base made up of oxide aluminium Al_2O_3 . For improving **toughness** metal components are added to cutting ceramics. For better cutting properties visker is added. Visker is a short fibre of silicon carbide. These materials have to be pressed at higher temperatures so the **fibre** would be **uniformly** distributed all around the plate.

Cubic nitride boron (KNB, CNB)



Cubic nitride boron can stand temperatures up to 2 000 °C and it is determined for machining only very hard materials. **Conversely**, soft materials can **debase** it by **gluing** them on plates.

Synthetic diamond



Synthetic diamonds are mostly used as adhesives. At temperatures above 600 °C they are considered as carbon and this causes their **depreciation**. There are used only as tips on plates.

2. Materials with a very precise chemical composition or with controlled porosity

They are sintered steels, structural and tool and high-speed. They can also be steels, **tin-leaded** bronze and teflon for the production of bearing **bushes**, materials for the production of filters, and other materials.



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3. Super alloys

They are alloys which are made of wolfram, tantalum, titanium, molybdenum, chromium and other materials. They stand out for their resistance against very high temperatures. They are used for producing for example airplane turbine blades.

4. Friction materials

They are materials, which have a high friction coefficient, for example *tin-leaded* bronze with silicon. For example they are used for *brake lining* in the automotive industry.



5. Magnetic ferrites

Magnetic ferrites are used for the production of for example, the antennas of *broadcasting* and telephone *transmitters*.

6. Pseudo alloys

Pseudo alloys are *solid heat-resistant* and *solid* materials which are used in extreme conditions, such as in reactors.

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VOCABULARY

abrasive resistance	odolnost proti odírání
brake lining	brzdové obložení
brittleness	křehkost
broadcasting	vysílání
bush	pouzdro
chip	tříška
clamp	upnout, připnout, svorka
conversely	naopak
crack	trhlina, praskat
cutting plate	řezná destička
debase	znehodnotit
depreciation	znehodnocení, opotřebení
durability	životnost
fibre	vlákno
fluent	plynulý
gluing	lepení
heat-resistant	žáruvzdorný
insufficiency	nedostatečnost
multi-layered	vícevrstvý
single-layered	jednovrstvý
soldering	pájení
solid	pevný
solidly	napevno
stand out	vynikat
sudden	náhlý, prudký
tin-leaded	cínoolověný
tough	houževnatý, pevný
toughness	houževnatost, pevnost
transmitter	vysílač
uniformly	rovnoměrně

COMPREHENSIVE QUESTIONS

1. What do you know about a cutting plate?
2. What types of alloyed carbides do you know?
3. What are the disadvantages of cutting ceramic material?
4. What are the super alloys?
5. Where do we use magnetic ferrites?

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EXERCISES

1. Match the words below with words 1-10 to make phrases. Then translate the expressions into Czech:

brake	abrasive	bearing	cutting	sintered
chemical	multi-	telephone	tin-	magnetic

- | | | | |
|----|-------------|-------|-------|
| 1 | layered | _____ | _____ |
| 2 | transmitter | _____ | _____ |
| 3 | bush | _____ | _____ |
| 4 | plate | _____ | _____ |
| 5 | resistance | _____ | _____ |
| 6 | leaded | _____ | _____ |
| 7 | lining | _____ | _____ |
| 8 | steel | _____ | _____ |
| 9 | ferrite | _____ | _____ |
| 10 | composition | _____ | _____ |

2. Here are five verbs. Make questions and ask partner.

- cut _____
- stand _____
- machine _____
- improve _____
- consider _____

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EXERCISES – key for teachers only

1. Match the words below with words 1-10 to make phrases. Then translate the expressions into Czech:

1	layered	multi-layered	vícevrstvý
2	transmitter	telephone transmitter	telefonní vysílač
3	bush	bearing bush	ložiskové pouzdro
4	plate	cutting plate	řezná destička
5	resistance	abrasive resistance	odolnost proti odírání
6	leaded	tin-leaded	cínoolověný
7	lining	brake lining	brzdové obložení
8	steel	sintered steel	spékaná ocel
9	ferrite	magnetic ferrite	magnetický ferit
10	composition	chemical composition	chemické složení