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 000º C.

**Types of alloyed carbides:**

a) **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.

b) **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.

c) **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.
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 Al₂O₃, TiC, TiN, and other elements.

**Cutting ceramics**

Cutting ceramic material stands out for its high temperature resistance – it can stand up to 1 300 ºC, 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 Al₂O₃. 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 ºC 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 ºC 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.
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. There are used for producing for example airplane turbine blades.

4. **Friction materials**

They are materials, which have a high friction co-efficient, 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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**Literature and sources used:** Miroslav Hluchý a kolektiv „, Strojírenská technologie 2, SNTL, Internet, Odborné texty SPŠ
VOCABULARY
abrasive resistance  odolnost proti odírání
brake lining  brzdové obložení
brittleness  křehkost
broadcasting  vysílání
bush  pouzdro
chip  tříska
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?
1. Match the words below with words 1-10 to make phrases. Then translate the expressions into Czech:

<table>
<thead>
<tr>
<th>brake</th>
<th>abrasive</th>
<th>bearing</th>
<th>cutting</th>
<th>sintered</th>
</tr>
</thead>
<tbody>
<tr>
<td>chemical</td>
<td>multi-</td>
<td>telephone</td>
<td>tin-</td>
<td>magnetic</td>
</tr>
</tbody>
</table>

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
EXERCISES – key for teachers only

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

<table>
<thead>
<tr>
<th></th>
<th>English</th>
<th>Czech</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>layered</td>
<td>multi-layered</td>
</tr>
<tr>
<td>2</td>
<td>transmitter</td>
<td>telephone transmitter</td>
</tr>
<tr>
<td>3</td>
<td>bush</td>
<td>bearing bush</td>
</tr>
<tr>
<td>4</td>
<td>plate</td>
<td>cutting plate</td>
</tr>
<tr>
<td>5</td>
<td>resistance</td>
<td>abrasive resistance</td>
</tr>
<tr>
<td>6</td>
<td>leaded</td>
<td>tin-leaded</td>
</tr>
<tr>
<td>7</td>
<td>lining</td>
<td>brake lining</td>
</tr>
<tr>
<td>8</td>
<td>steel</td>
<td>sintered steel</td>
</tr>
<tr>
<td>9</td>
<td>ferrite</td>
<td>magnetic ferrite</td>
</tr>
<tr>
<td>10</td>
<td>composition</td>
<td>chemical composition</td>
</tr>
</tbody>
</table>