SINTERED ALUMINUM ALLOY FOR ANTIFRICTION PURPOSES

Description
A new Al-based material and a manufacturing technology for antifriction elements from this material by the method of cold pressing of powder mixtures with subsequent sintering and calibration have been developed. The alloy is designed for replacing sintered and cast deformed tin bronze in production equipment and articles, where cost reduction, wear-resistance enhancement, and weight reduction are important.

Technical specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Range</th>
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</thead>
<tbody>
<tr>
<td>Porosity, %</td>
<td>5 – 10</td>
</tr>
<tr>
<td>Strength, MPa</td>
<td>180 – 200</td>
</tr>
<tr>
<td>Plasticity, %</td>
<td>1 – 2</td>
</tr>
<tr>
<td>Hardness HB, MPa</td>
<td>900 – 1100</td>
</tr>
<tr>
<td>Friction coefficient without lubrication</td>
<td>0.08 – 0.1</td>
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<tr>
<td>Friction coefficient with lubrication</td>
<td>0.01 – 0.03</td>
</tr>
<tr>
<td>PV parameter, MPa·m/sec</td>
<td>10 – 15</td>
</tr>
<tr>
<td>Operating temperature, °C</td>
<td>from −60 to +100</td>
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</tbody>
</table>

Sintered slide bearings made of the aluminum alloy.

Technical appraisal and economic benefits
As compared to iron and copper, aluminum has such important properties as lower specific weight and higher corrosion resistance. In contrast to tin bronze, the advantages of the sintered aluminum material as an antifriction material operating at high sliding velocities are its higher thermal conductivity of aluminum (which is often important for bearing cooling), smaller weight of articles (hence, lower noise and vibrations), higher wear resistance (due to a high aluminate particle content up to 60 vol. %), and the fact that aluminum does not chemically decompose lubrication.

Replacement of sintered iron by powder aluminum saves costs of electric power spent for pressing (required pressure is 2 times lower) and sintering (sintering temperature is 1150 °C for iron and 600 °C for aluminum). Cost reduction in the production of sintered Al-based sliding bearings as compared to bronze and brass bearings is owing to a lower price of aluminum powder per unit volume of the material and to application of lower-cost dopes.
**Application areas**
As an antifriction material, the sintered aluminum alloy is designed for the use in aircraft, automobile, tractor, machine-tool, instrument-making, and defense industries, in production equipment for chemical, oil, pharmaceutical, food, and others industries. It is also used in production of computers, electric motors, and household appliances, i.e., where sintered tin bronze is used.

**Development stage**
The “Korus” small-scale enterprise at the Institute of Strength Physics and Materials Science, Siberian Branch, Russian Academy of Sciences supplies sliding bearings made of the new sintered aluminum alloy to worsted-cloth factories in Kyrgyzia and Russia, to petrochemical and electric-bulb plants, tobacco factories, and trolleybus depots of several Russian cities, to repair shops for motor transport and household appliances. Responses and test certificates from the enterprises substantiate good performance of the antifriction-purpose sintered aluminum alloy and point to the efficiency of its application in the production of sliding bearings for transport and production equipment in different branches of industry.

**Patent situation**
The technology is protected by the USSR inventor's certificate and the patent of the Russian Federation.

**Commercial offers**
Know-how transfer.
Joint commercialization.
Agreement on further research work and developments for obtaining manufacturing technologies.

**Estimated cost**
To be negotiated.

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