Physico-chemical nanomaterials science

Heat-resistant polymers in friction units

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One of the ways of successful solution of the problem of increasing the reliability and durability of machines is the use of friction polymeric materials which having specific properties which enable to resolve with a new deal a number of technical issues dealing with increasing the life of the machines.

Currently friction bearings based on thermosetting and thermoplastic resins are widely used. However, the low thermal resistance (393 - 433 K) of these polymers limits their effective application in such industries as heavy engineering, where the machines' work is characterized by high loads, speeds and much heat on the surfaces of the contacting media.

The development of modern technology led to the creation of polymeric materials with enhanced performance characteristics at high temperatures. These polymers include polyimides, polyarylates, aromatic polyamides and others.

Aromatic polyamide phenylone (APP) is fully aromatic polyamide with a temperature limits of the performance from 173 to 523 K. Taking in consideration needs of steel plants in scarce metals (bronze, babbitt) it was conducted the investigation on studying to possibility of using APP and compositions on its basis for friction bearings operating under severe conditions in order to replace the non-ferrous metals and alloys.

Investigations were carried out at the facility, simulating operation of the friction pair shaft- friction bearing when lubricating with oil "Industrial-50" (GOST 1707-51) and lubrication grease IP-01 (GOST 3257-53). As a filler for a composition based on phenylone was selected fine aluminum powder (PA-1).

Analysis of the results leads to the conclusion that in conditions of high loads and speeds, when lubricating with oil and APP Metallopolimer (MP) based on it as bearing materials, have a high wear resistance. APP exceeds babbitt and bronze on wearing resistance in 2.3 and 20 times respectively, and MP on its base in 9 and 79 times. It was found that very little phenylone wears metallic counterface. Lack of lubrication on the sliding speed of 6 m / s and a load of 1 MPa leads to a temperature in the friction zone which is significantly higher than the glass transition phenylone and, as a consequence, to the destruction of the working layer of phenylone and breaking of half-liner. However, MP based on it on this mode is efficient and wearing is no more than wearing of babbitt.