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NASA TECH BRIEF

High Temperature Coatings for Gas Bearings

A unique combination of coating materials for the bearing surfaces of gas bearings has been identified which substantially enhances bearing performance at temperatures up to 1400°F.

Gas bearings require wear- and damage-resistant surfaces. Even a small amount of surface deformation can destroy bearing effectiveness by upsetting the close clearances and alignment of component parts that must be maintained. In self-acting gas bearings, damage can occur during starts and stops when the bearings are in rubbing contact with the journals at low speeds under loads as low as 2 to 3 psi. At high speeds, both self-acting and externally pressurized gas bearings must be capable of resisting damage in the event of accidental rubbing caused by shock loads, unstable operation, or vibration.

In the severe environments encountered by advanced spacecraft and aircraft, high operating temperatures often preclude the use of conventional lubricants, and, in non-oxidizing environments, protective oxide films rubbed off are not reformed.

A research program to identify suitable coating materials for gas bearing surfaces considered six combinations of materials selected as the most promising. One combination, a plasma-sprayed Al_2O_3 coating applied to the bearing surface and a plasma-sprayed 25% nickel-chrome bonded chrome carbide coating applied to the journal surface, produced superior performance. Bearings coated with these materials performed well at temperatures to 1400°F; 1000 start-stop cycles and 90 deliberately induced high-speed rubs at 38,500 rpm caused no chipping or spalling of the coating surfaces. These same coatings were also tested on thrust bearings and the same superior performance was achieved.

Notes:

1. In addition to gas bearings, this combination of materials can also be applied to coating the surfaces of process fluid lubricated bearings.
2. Tests were performed in an inert gas (argon) environment.
3. Documentation is available from:
   Clearinghouse for Federal Scientific and Technical Information
   Springfield, Virginia 22151
   Price: $3.00
   Reference: TSP69-10200
4. Technical questions may be directed to:
   Technology Utilization Officer
   Lewis Research Center
   21000 Brookpark Road
   Cleveland, Ohio 44135
   Reference: B69-10200

Patent Status:

No patent action is contemplated by NASA.

Source: S. F. Murray of
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