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NASA TECH BRIEF

Study of High Temperature Bearing Materials

An experimental investigation has identified materials suitable for use in potassium lubricated turbogenerator journal bearing and shaft applications at temperatures from 400° to 1,600°F. Much of the information obtained during the program appeared useful to other high temperature bearing applications.

From a compiled list of 100 materials, 14 candidates were selected for detailed evaluation singly and in combination. The candidates represented five broad classes of materials: Nonrefractory metals and alloys, refractory metals and alloys, Fe-Ni-Co bonded carbides, refractory compounds (oxides, carbides, borides), and refractory metal bonded carbides.

Evaluation of the materials was based on the following experimental information:

1) Friction and wear behavior in high vacuum (10^{-9} torr; no lubrication).
2) Friction and wear behavior under boundary lubrication with liquid potassium.
3) Compatibility in potassium in Cb-1Zr.
4) Dimensional stability.
5) Strength.
6) Hardness.
7) Wettability by potassium.

Particular attention was given to the predicted chemical stability of the materials. Also, two separate service temperature regimes were established: above 1000°F and below 1000°F. The higher temperature simplifies system design. The lower simplifies bearing materials selection.

The most appropriate materials for this service were: TiC + 10% Cb, commercial cobalt bonded carbides (e.g., carboloy 907 or equivalent material), a cold pressed and sintered alloy of tungsten and molybdenum. The first two groups of material were applicable above 1000°F and the third applicable below 1000°F.

Notes:

1. Additional documentation is available from:
   Clearinghouse for Federal Scientific and Technical Information
   Springfield, Virginia 22151
   Price $3.00
   Reference: TSP69-10252
2. Technical questions may be directed to:
   Technology Utilization Officer
   Lewis Research Center
   21000 Brookpark Road
   Cleveland, Ohio 44135
   Reference: B69-10252

Patent status:

No patent action is contemplated by NASA.

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