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DISCUSSION

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Mr. Wallace states that the mechanism of lubrication is a matter of conjecture for the sintered carbides. Since the paper was written some time ago, I wonder whether the author has come to any different conclusions after further study.

The data on wear with sintered carbides of Table 7 are intriguing if I am interpreting the results correctly. The series of tungsten carbides with increasing cobalt content seem to show appreciable improvement in friction and wear as cobalt content increases. For example, the wear rating on the flat is 3 for cobalt contents of 3.1, 3.3, and 3.86 percent; in contrast the wear rating is 1 for cobalt conditions of 5.55 and 8 percent. We at the NASA Cleveland laboratories have always felt that the binder in bonded carbides can have a strong beneficial influence on the friction and wear properties of these materials. These data seem to bring out this conclusion if my interpretation is correct.

Author's Closure

I would like to thank Mr. Bisson for his discussion of this paper.

Since the termination of the initial study, I have done no additional work with liquid metal bearing materials; therefore, the mechanism of lubrication is still a matter of speculation. Although I offer the double-oxide formation for the development of the boundary lubricant, there may still be the possibility that the binder in the bonded carbides has a beneficial influence on the wear and frictional properties. But I attribute the differences of the ratings of 1 and 3 on the flat rub shoes for cases cited by Mr. Bisson to the loss of lithium and not the differences in cobalt concentration. With the loss of lithium, the source of boundary lubrication and heat-transfer medium is not available and, therefore, increased wear and surface damage occurs. The disk to flat rub shoe variation in the rating of 1 versus 3 for the same material (Kll, Carboloy 999, 905) is attributed to the constant contact of the shoe as opposed to only a very small area of contact on the disk at any time during the short duration with no lithium before the rotation stopped.

[2] These reports may be obtained from Department Technical Information Center, Oak Ridge, Tenn.

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