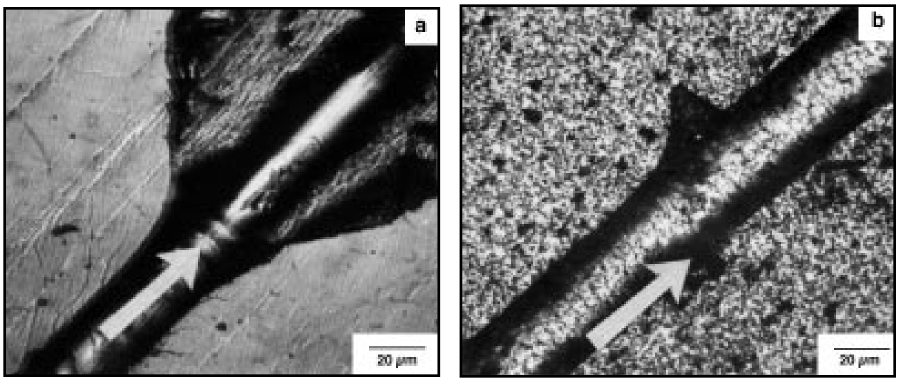

Fig. 6—Optical micrographs of scratching track of: (a) Ni-P; (b) Ni-P-32%B_4C coatings.

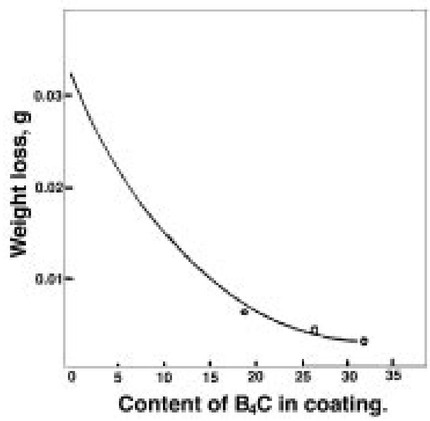

Fig. 7—Effect of B_4C on wearability (weight loss).

Wearability

Figure 7 indicates that the wearability of Ni-P-B_4C coatings is considerably improved with increasing B_4C content in the layer. The wearability of Ni-P-32%B_4C coating is 16 times that of the Ni-P deposit layer. The worn surface of the Ni-P-B_4C composite coatings was observed by SEM, with the result as shown in Fig. 8. The micrograph reveals that there exist many wear tracks on the surface. When the B_4C content in the composite layer increases, the wear tracks decrease, and many nodular protrusion are preserved. This indicates that wearability is upgraded with increasing B_4C particle content.

The result described above may be explained as follows: B_4C particles in the composite coatings are either partly revealed or wholly embedded in the Ni-P matrix, and the more B_4C particles contained, the more nodular protrusion. During wear tests, the B_4C particles in the layer cause increase of support points, thereby upgrading wearability. The Ni-P deposit surface resists the wear but has no hard particles to withstand wearing. Thus, the higher the content of B_4C in the deposit, the better the wearability of the composite deposit.

Conclusions

1. With increasing content of B_4C in coatings, the surface nodular protrusions increase, but their size becomes smaller.
2. The B_4C particles are evenly dispersed in the Ni-P matrix and the presence of B_4C particles doesn't change the phase composition of the Ni-P alloy.
3. With increasing content of B_4C in composite coatings, the adhesive force of composite plating coatings decreases, but the wearability and hardness significantly increase.

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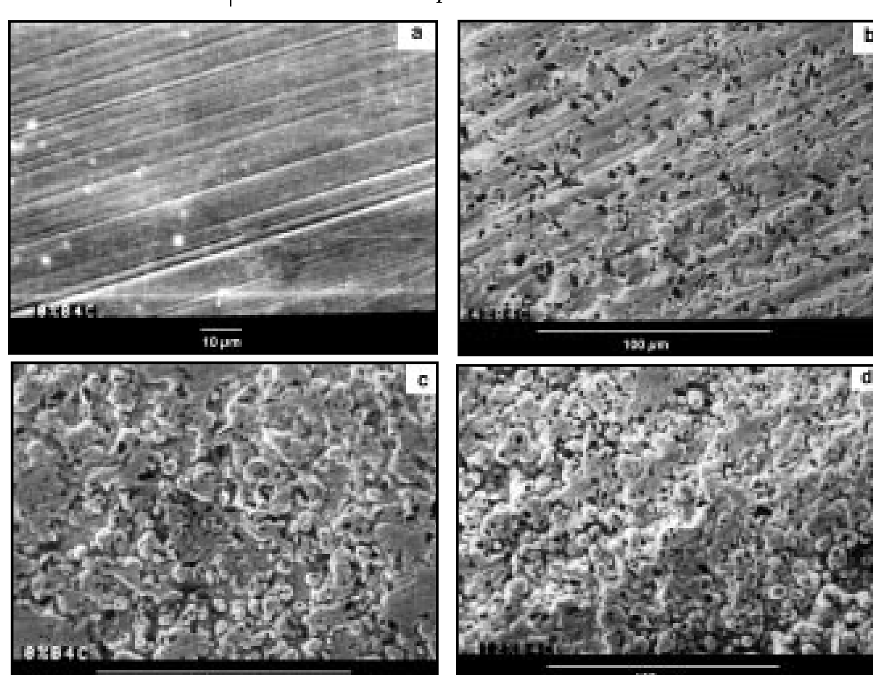

Fig. 8—SEM micrograph of the worn surface of coatings: (a) Ni-P; (b) Ni-P-19%B_4; (c) Ni-P-26%B_4C; (d) Ni-P-32%B_4C.