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Tribological behavior of HFCVD multilayer diamond film on silicon carbide

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Abstract: A novel deposition method combining hot filament chemical vapor deposition (CVD) method is proposed, with which a multilayer diamond film consisting of three layers of microcrystalline diamond (MCD) film with the gradually decreasing grain size as the number of layers increase is fabricated on silicon carbide substrate. The tribological behavior is examined on a reciprocating ball-on-plate tribometer. Meanwhile, the silicon carbide and one-layer diamond film are also conducted for comparison. The experimental results show that the friction coefficients of the silicon carbide are 0.35 and 0.40 for dry sliding against tungsten carbide and silicon nitride counterfaces, respectively. The corresponding friction coefficients of the one-layer diamond film reduce to 0.30 and 0.14, and the multilayer diamond film for these two contacts reaches to the lowest friction coefficients of 0.28 and 0.07. Moreover, the multilayer diamond film not only presents the high wear resistance, but also greatly reduces the wear rate of its counterpart as compared with the one-layer diamond film. Hence, the multilayer diamond film can be regarded as an alternative and potential technique to improve the tribological behavior of diamond film.

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