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Friction and wear of nanocrystalline diamond coatings. ABHISHEK KOTHARI, BRIAN SHELDON, Brown University, XINGCHENG XIAO, GM research, KYUNG-SUK KIM, Brown University, LEO LEV, GM — Nanocrystalline diamond films were tested for friction and wear response using a pin on disc tribometer. COF, starting with 0.7 successively drops to 0.1 as the wear progresses. Understanding this friction and wear response is important to minimize wear of these materials as tool coatings. SEM images at the periphery of wear tracks indicate the presence of ring cracks which are due to stress at the circle of contact exceeding the tensile strength. Effects of engineering the stress on the wear have been verified experimentally. Estimation of wear rate in these coatings is of high importance. AFM was used to obtain topography information on wear tracks of the film successively after 2K-200K pin revolutions in the tribometer. It is noted that peak heights of the asperities were decreasing with wear. Image analysis of the topographical evolution of the successive wear tracks could provide an estimation of the wear rate. This analysis also indicates that the distribution of asperity contact size shifts towards larger size with successive wear of the film. Previous studies of Krim, Hurtado and Kim revealed that the frictional stresses of individual asperities are dependent on the asperity contact sizes – the larger the asperity contact size, the lower the frictional stresses. The micromechanics model of asperity friction explains well the decreasing of coefficient of friction with progression of wear.

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