Abstract Submitted
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Nanotribological Properties of Positively and Negatively charged nanodiamonds as additives to solutions[1] ZIJIAN LIU, STEVEN CORLEY, North Carolina State University, OLGA SHENDEROVA, International Technology Center, DONALD BRENNER, JACQUELINE KRIM, North Carolina State University — Nano-diamond (ND) particles are known to be beneficial for wear and friction reduction when used as additives in liquids,[1] but the fundamental origins of the improvement in tribological properties has not been established. In order to explore this issue, we have investigated the nanotribological properties of ND coated with self-assembled monolayers (SAM) as additives to solutions, employing gold/chrome coated quartz crystal microbalances (QCM). Measurements were performed with the QCM initially immersed in deionized water. ND particles with positively and negatively charged SAM end groups were then added to the water, while the frequency and amplitude of the QCM were monitored. Negative shifts in both the QCM frequency and amplitude were observed when ND with positively charged SAM end groups were added, while positive shifts in both the QCM frequency and amplitude were observed when ND with negatively charged ND end groups were added . The results are consistent with a lubricating effect for the negatively charged ND, but were only observed for sufficiently small negative ND particle size. Experiments on QCM surfaces with differing textures and roughness are in progress, to determine the separate contributing effects of surface roughness charge-water interactions. 1. V. N. Mochalin, et al, Nat. Nanotech. 7, 11–23 (2012) doi:10.1038/nnano.2011.209

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