

R&D on Nanodiamond Formation and Application

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New tribological coatings from detonation nanodiamonds and their mixtures with elemental titanium powder were produced by a novel plasma spraying process called electromagnetically accelerated plasma spraying (EMAPS). The products of nanodiamond spraying mainly showed an onion-like carbon (OLC) structure. Friction measurements conducted at 0.5-1 N applied loads showed that the synthesized carbon coatings significantly decreased friction in the sliding pair SiC ball/stainless steel substrate in comparison to the uncoated substrate, especially at high-vacuum conditions. The coatings prepared from Ti and ND mixtures (2 and 5 volume % of ND) demonstrated improved hardness and tribological characteristics in comparison with pure Ti coatings. The formation of TiC during EMAPS was confirmed by X-ray diffraction. Although further effort is necessary to improve the quality of deposits, EMAPS is considered to be an effective process for the development of tribological coatings using ND, OLC, and their composites.