

Micro-texture and structure of laser-cut surface of diamonds

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Laser-cut surfaces of various types of diamonds including synthetic type Ib, IIa and nano-polycrystalline diamonds (NPD) were examined by scanning and transmission electron microscopies (SEM & TEM). SEM observation showed that the laser-cut grooves are filled with a large amount of debris composed of flaky to spherical particles with submicron sizes (0.1-0.5 micron). TEM investigations on FIB (focused ion beam)-cross sections, prepared across the grooves, revealed that in all types of the diamond samples observed the debris consists of textually different types of carbon layers and the total thickness of the debris layers is approximately 1-1.5 μm . The debris layers are generally divided into three types, (1) highly oriented, highly crystalline graphite (HOHC) layer, (2) oriented microcrystalline graphite (OMG) layer, and (3) non-oriented microcrystalline graphite (NOMG) layer, from the basal (unaltered) diamond surface to the center of the groove.