BLACK TREATED DIAMOND WITH COLOUR ZONING

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Recently, the author had the possibility to test a black diamond of 4.38 ct (Fig 1) which a client submitted to the SSEF Swiss Gemmological Institute. The black brilliant cut stone displayed a very peculiar colour zoning. When viewed from the top, it showed a regular colourless part in the centre surrounded by a nearly opaque black rim (Fig 2). This colourless part was relatively shallow and not seen throughout the whole stone. The shape of the colourless zone on the table facet resembled the scheme of the ideal proportions of a brilliant cut seen from the side. As we had not seen such a zoning before, we took a closer look at the stone.

Under the microscope, the colourless central part of the diamond showed a few large black inclusions. In reflected light, this part revealed a polished surface slightly below the rest of the surface. The outer rim of the stone was black due to a high number of tiny carbon inclusions, amorphous carbon or graphite, along small cleavage cracks. The distribution of these black inclusions was very dense. The shape of the observed zoning was interpreted as a growth structure. The outline can easily be explained as the result of the intersection of an octahedral diamond crystal with the plane of the table facet of the cut stone. See Fig 3, side-view through diamond crystal and resulting pattern on table facet of cut stone.

Black amorphous carbon or graphite inclusions in diamonds may be the result of natural transformation of diamond into these carbon phases or may be induced by a High Temperature (HT) treatment. Especially since black diamonds have become a fashion in the jewellery market, a lot of diamonds have been treated by such an HT process.

A dense distribution of tiny black inclusions in a diamond with similar zoning, as in our specimen, has already been described by our colleagues from the GAAJ laboratory in Tokyo in HT treated diamonds. See Hiroshi Kitawaki: Identification of Black Diamond, *GAAJ Gemmology, November issue, 2004*. To prove if our specimen had been treated or not, we cooled the diamond with liquid nitrogen and took a photoluminescence spectrum using the laser of our Raman system. The resulting spectrum fitted very well with the reference spectra of HT treated black diamonds.

Based on our results, the stone was identified as a natural diamond with artificial colour, produced by an HT treatment.

Left: Fig 1:
Black diamond.
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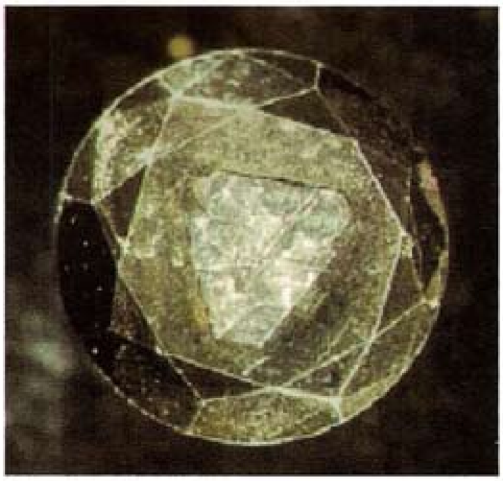

Right: Fig 2:
Black diamond with colourless central zone and black rim due to many small black inclusions.
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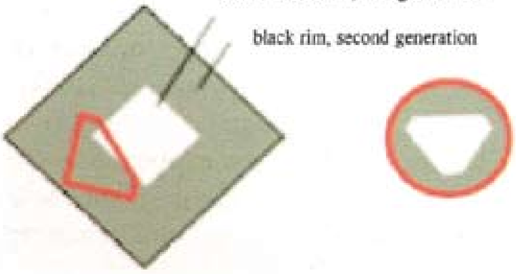

Left: Fig 3:
Schemes of a diamond crystal with a colourless centre, first diamond generation, and a black rim, second diamond generation, produced by HT treatment.
Left:
Side view of rough crystal before cutting.
Right:
Resulting pattern on the table facet of the cut stone.
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