ORDERING OF PARAMAGNETIC DEFECTS IN NATURAL DIAMONDS WITH MICROTWINS.

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Up to now all paramagnetic centers observed in diamond crystals were found to align with a single coordinate system determined by crystallographic axes. In this respect, natural plastically deformed diamonds with brown and pink colours were not different from diamonds, which had not suffered any postgrowth transformation. However, the present EPR study of violet diamonds with planar deformation lamellae observed with an optical microscope has shown that the behaviour of such crystals was very unusual.

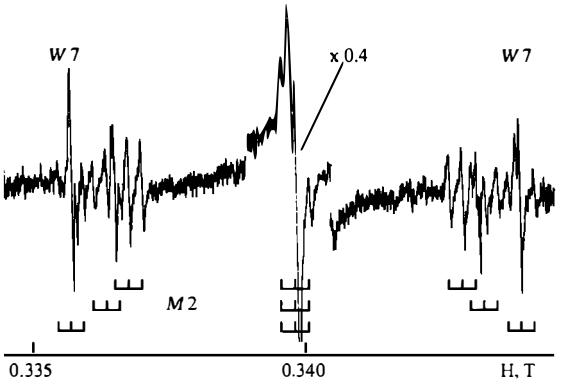

Fig. 1. X-band EPR spectrum for violet diamond containing W7 and unusually oriented M2 centers, recorded at room temperature with magnetic field along [001]

A large number of additional lines was discovered in an EPR spectrum of violet diamond recorded at standard diagnostic orientation with $H \| L_4$ (Fig. 1). There was no doubt that these lines belong to a center including two nonequivalent nitrogen atoms, as well known *N*1 and *W*7 centers and recently discovered by us *M*2 and *M*3 centers. Analysis of the angular dependence of the spectra shows that hyperfine parameters for both nitrogen atoms are similar to those for *M*2. However, the main axes of these tensors do not coincide with the crystal axes, but correspond to {111} orientations of lamellae, which are twinned after a spinel law. Visual analysis displays that the amount of twinned lamellae in violet diamonds is not more than 1%, but all observed *M*2 centers are located in them. Regarding the *W*7 center, the most characteristic for plastically deformed diamonds, its content is roughly the same in the whole main part of the crystal and in the twinned lamellae.

Therefore, our investigation reveals that plastic deformation in natural violet diamonds could occur by a mechanical microtwinning. EPR gives the possibility to see this process from the inside through the analysis of paramagnetic defect transformations showing the change in the crystal structure at the level of individual atoms.

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