

Absorption and reflectance UV-VIS-IR-spectroscopy application for lattice defects research in diamonds

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Several samples of natural and synthetic diamonds were investigated by the means of UV-VIS-IR-range absorption and reflectance spectroscopy (at room temperature). Also electron microscopy, spectral (at liquid nitrogen temperature) cathodeluminescence and color cathodeluminescence were applied to study them.

One of the purposes of the research was to make some correlation between absorption and reflectance spectra in UV-VIS-IR-ranges and to proceed with lattice defects concentration calculation. Other includes investigation of diamond color origin, modeling of structure of some lattice defects in diamonds and modeling of transformational mechanisms of lattice defects during annealing and irradiation processes.

We investigated the collection of several octahedral natural diamond crystals, synthetic diamond crystals, flat plates cut from natural and synthetic diamonds. Several samples (natural octahedral diamond crystal) have undergone annealing at the high temperatures of 1700-1800 degrees C under high pressure (about 6 GPa, during 6 hours), some samples (octahedral natural diamond crystals, natural and synthetic diamond flat plates) were irradiated by protons, several samples undergone color changing to black by new technology at low P-T-parameters. Irradiated samples then were annealed at the different temperatures in the range of 800-900 degrees C during 4-5 hours. Before and after annealing and irradiation spectroscopic data was acquired.

Interpreting of acquired data allows to model structure of some lattice defects in diamond and also provides a useful information on mechanisms of the transformation and stability of lattice defects in diamonds and causes of diamond color.