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Pressure measurements from Raman spectra of stressed diamond anvils.

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Problem of pressure measurements in a diamond anvil cell from Raman spectra of stressed diamond anvils have been studied. A splitting of the threefold-degenerate optic mode of diamond into singlet and doublet modes was observed in the Raman spectra from the stressed anvils. On the basis of the splitting effect quantitative relations between Raman spectra from the diamond anvil tip, stresses in the anvil tip and pressure in a sample have been considered [1]. The calibration of the Raman spectra against the sample pressure up to 220 GPa has been proposed. Experimental stress tensor study in the anvil tip permits comparison of the present data with theoretical calculations of diamond compressibility.

A correctness of pressure measurements procedure in the sample from high-frequency side of the Raman spectra profile has been studied on the base of the obtained results. Problems of the critical focus point shift from the culet and measurements stability and reproducibility are discussed. Data of the present study are in good correlation with recent experimental data of Ref. [2] (3 Mbar) and [3] (2.5 Mbar) as well theoretical calculations [4]. The obtained results demonstrate, that Raman spectra from the diamond anvil tip can be widely used for measurements of the normal stress in the sample (or pressure for the quasi-hydrostatic compression).

References:

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