

Mahebab Alam

Jon Pokorny, Vincent Mortet

FZU - Institute of Physics of the Czech Academy of Sciences, Na Slovance 1999/2, Prague, Czech Republic

Email: alam@fzu.cz

Polarized Raman Spectroscopy of boron-doped diamond

Raman spectroscopy is a fast and non-destructive method for the characterization of the composition of materials. Polarized Raman spectroscopy or angle resolved Raman measurement is now a rising analysis technique in material science. In particular, it allows the determination of the crystalline axis of the sample. Boron doped diamond is important in material science for electrochemical, electronic, and optoelectronic device applications. Using Raman spectroscopy, one can easily determine the concentration of boron in heavily doped diamond with metallic conductivity. Although the Raman spectrum the heavily boron-doped diamond (hBDD) can be fitted by a combination of classical model electronic Raman scattering and Fano effect, several features of hBDD remain unclear. In this work, we use polarized Raman spectroscopy to better understand the Raman spectrum of hBDD. Three plasma enhanced chemical vapor deposition epitaxial boron doped diamond layers with three different crystalline orientations (100, 111, and 113) have been studied using different excitation wavelengths (325, 488, 514, and 785 nm). The boron concentration within the epitaxial layers was determined from the unperturbed FWHM of the diamond zone-center phonon peak. Polarized Raman results varies with the crystalline orientation and the excitation wavelength. Collected spectra are fitted using a combination of classical model electronic Raman scattering and Fano effect. This analysis evidence the presence a new Raman peaks and a variation of the electronic Raman scattering with the crystalline orientation and the light polarization.

References

- [1] V. Mortet et. al., Carbon, 2020, 168, 319.
- [2] H. Zobeiri et. al., Journal of Physical Chemistry C, 2019, 123, 23236.
- [3] Y. Chang et. al., Crystals, 2021, 11, 626.
- [4] J. Kim et. al., J. Phys.: Condens. Matter. 2020, 32, 343001.

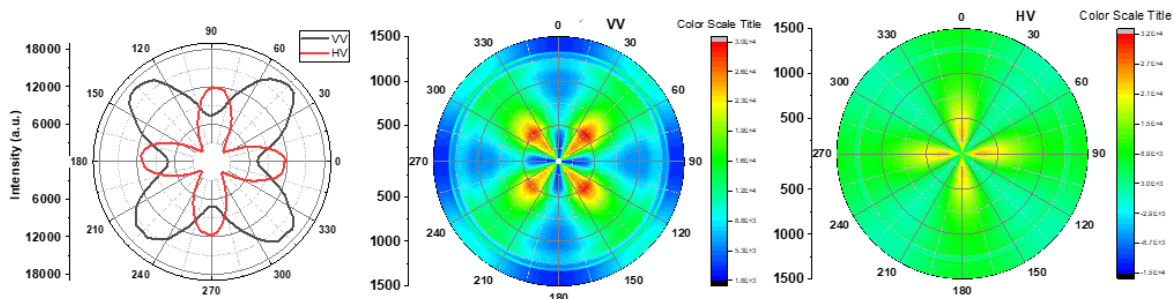


Figure 1: Raman intensity distribution of backscattering for the parallel (VV) and vertical (HV) polarization.