Title: Study of semiconductors by methods of time resolved laser spectroscopy: Luminescence spectroscopy of nanocrystalline diamond

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Abstract: The PhD thesis is focused on optical properties of nanocrystalline diamond prepared by chemical vapour deposition method. Photoluminescence of nanocrystalline diamond samples and effects of ambient temperature, pressure, pH and UV irradiation on it are studied by laser spectroscopy. Results suggest the keyrole of water and air adsorbates which affect the energy states in the sub-bandgap region of diamond. Photoluminescence decay of samples of different surface termination and structure and its dependency on ambient pressure and temperature is studied by methods of ultrafast (picosecond and nanosecond scale) laser spectroscopy. Results are analysed by power-law decay function which fits well the luminescence decay curves and also describes the dynamics of charge carriers in states localised within the bandgap. The model of interaction of nanocrystalline diamond with air adsorbates is proposed. Non-linear optical properties of nanocrystalline diamond are also studied, namely the generation of second and third harmonic frequency. The thesis describes complex behaviour of luminescence processes and give and insight into the luminiscence mechanisms.

Keywords: ultrafast spectroscopy, luminescence, nanocrystals, diamond