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sublevel) transitions of Cr^{3+} ions with the behaviors of luminescence intensities of the R_1 and R_2 lines as a function of excitation wavenumber is investigated. The dependence of the intensity of R_1 and R_2 luminescence peaks on the pump wavenumber practically coincides with the shape of these absorption bands. The luminescence intensity is normalized to the radiation power of a semiconductor laser. As far as we know, for the first time we observed under certain excitation wavenumber the shifts of luminescence peaks which are multiple to the value 0.52 cm^{-1} (multiplication factor – 1, 2, 3).

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Tunable excitonic absorption in gapped graphene systems

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Theoretical and experimental investigations of optical properties of graphene systems so far have been mainly focused in monolayer graphene. Meanwhile, in the physics of graphene there is growing interest in bilayer and trilayer graphene systems, where the electronic band structures are richer than in monolayer graphene and can be easily manipulated by external field [1].

Theoretical and experimental investigations have shown that a perpendicular electric field applied to bilayer of graphene modifies its band structure near the K point and may open an energy gap in the electronic spectrum, which is tunable by the gate voltage [2]. Experimental investigations showed that the induced gap between the conduction and valence bands could be tuned between zero and midinfrared energies. Also, the magnitude of the gap strongly depends on the number of graphene layers and its stacking order [3]. Multilayer graphene systems

with tunable band structure can be useful for different goals of nano- and optoelectronics.

In order to understand the influence of Coulomb interaction and impact of many body physics in graphene systems it is essential to study electronic and optical properties of graphene systems with opened energy gap. In gapless monolayer graphene, the Coulomb problem has no true bound states, but resonances [4]. The optical response of graphene with an opened energy gap between the conduction and valence bands is dominated by bound excitons.

In this work excitonic absorption in graphene systems (monolayer and bilayer) with opened energy gap in the field of laser radiation is investigated for different values of the gap and the parameters describing the band structure.

The obtained value of excitonic binding energy in monolayer is in good agreement with the exact analytical solution.

It is shown that the account of all tight binding parameters in bilayer graphene leads to strong increase of exciton binding energy.

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Microstructure and chemical composition of the YSZ and La, Mg - hexaaluminate double-ceramic-layer TBC systems

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The Ni(Co)CrAlY bond coat (BC) and ceramic thermo-insulating layer (TC) are the parts of complex thermal barrier coatings (TBCs) used to protect the metal components of gas turbine engines. The increase in their efficiency is associated with an increase in the temperature of the turbine gas (> 1200°C), which requires a reduction in the thermal conductivity of the TC, high heat resistance and long-term stability at high temperatures. A new concept for multilayer BC preparation in order to have a better conformity between the BC and TC and, thus, an improved thermal characteristics and mechanical performance of the TBC is developed [1]. One of the promising materials for the TC, as well as for laser applications, is $LaMgAl_{11}O_{19}$ hexaaluminate. In this study, the microstructure and chemical composition of TBCs were studied (SEM, EDX) after a short time thermal cycling