Excitonic recombination processes in solids

Marek Godlewski#

Institute of Physics, Polish Academy of Sciences
02-668 Warsaw, Al. Lotników 32/46, Poland

Free excitons were first observed experimentally in ionic materials. Nature of the relevant recombination process was explained by Frenkel – Frenkel exciton. Then, an analogous process was proposed for semiconductors – Wannier-Mott exciton. In both the cases exciton is an excited state of a perfect crystal. Soon after impurity/defects bound excitons were observed experimentally. These are excited state of defects/impurities. In the lecture I will explain mechanisms of binding of such excitons. I will introduce Haynes rule and concept of satellite lines of bound excitons.

Whereas donor or acceptor bound excitons result in radiative recombination and observation of spectrally sharp luminescence lines, this often is not the case for excitons bound at deep defects. It is now believed that both rare earth (RE) and transition metal (TM) ions can bound excitons. Such excitons, in most of the cases, decay nonradiatively by an energy transfer, which results in intra-shell RE or TM excitation.

corresponding author: godlew@ifpan.edu.pl