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The nanophotonic behaviors of wideband diluted magnetic semiconductor nanostructures**Bingsuo Zou**

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Optical properties of diluted magnetic semiconductor (DMS) are not well understood so far, especially relationship to their ferromagnetism. Here we prepared Mn ion doped ZnO, CdS and ZnSe nanostructures by CVD method, studied their optical properties via microphotoluminescence techniques, found many very interesting properties, which are all related to the exciton magnetic polaron (EMP), itinerant or partially itinerant, their energy levels go well with the *ab initio* calculations. In ZnO:Mn nanowires, the EMP can show up with free exciton together for very diluted doping (<0.001%), this EMP can form condensate to produce single mode lasing line at fs pulse excitation along with the disappearing of free excitons, which indicate a condensation of EMP. With a little bit large amount of Mn doping, the nanowire show EMP lasing mode with background at fs laser pulse excitation, but at even high power, some electron-hole plasma induced lasing modes could be observed due to the carrier effect. The time-delayed photoluminescence by ns laser pulse are also studied, only free EMP and localized EMP (d-d transition) show up in the emission spectra, we gave the clear assignments for all the d-d transitions of Mn in ZnO, which have been argued for a long time. It is more interesting that these d-d transitions exhibit clear enhanced coherent relaxation behaviors with increasing excitation power, like that by free excitons, even couple with LO phonons, and show a collective spin-dependent coherent radiation, which may be used for quantum modulation applications. We also observed the Mn-O-Mn cluster peak in the long wavelength range, which may be related to the ferromagnetic properties. In CdS:Mn nanowires, we found many peaks longer than the single Mn ion emission band (575nm) when increasing the Mn concentration, we used a simple hydrogen-like cloud theoretical model to describe them well, in this model, the Mn-S-Mn-Segregate with variable Mn ion number and their ferromagnetic coupling are considered. The SQUID detection proved the ferromagnetic behavior of the aggregate, and MFM imaging indicated its cluster nature in a microbelt or nanowire. *Ab initio* calculation results also support our assignments. The aggregation of Mn ion in II-VI semiconductor microstructures can produce ferromagnetic and PL emission at the same time.

Biography

Bingsuo Zou has done his Doctorate degree from Jilin University in 1991, Post-doctoral studies from Nankai University and joined as a Faculty member at Institute of Physics, CAS in 1994. He has visited National University of Singapore and Georgia Tech as a Visiting Scholar in 1996-1999. In 2005, he joined the Huna University as a Faculty member in the School of Physics and Microelectronics. In 2006, he was nominated and enrolled as a Changjiang Scholar of MOE. In 2009, he joined the faculty of BIT (Beijing Institute of Technology) as the Dean of School of MSE. Currently, he is the Director of Micro Nano Technology Center of BIT.

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