Auger-assisted hole transfer from photoexcited ZnO to CdS quantum dots

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Photoinduced process leading to charge separation between quantum dot (QD) donor-acceptor system is yet poorly understood. Utilizing steady state and time resolve emission spectroscopy, we have studied hole transfer from ZnO to CdS QDs.[1] Energy level diagram and quenching of excitonic emission (both intensity and lifetime of ZnO QD) reveals that hole transfer is happening from photoexcited ZnO to CdS QDs. We have investigated the relationship between driving force and hole transfer rate. The results suggest that experimental data points do not follow the conventional Marcus model rather fit with newly posited Auger-assisted transfer mechanism[2] where excess energy is used for electronic excitation, instead lost through vibration.[3] Moreover, we have reported the enhanced photoconductivity of the film made of the blend of ZnO and CdS QDs as a consequence of hole transfer. We believe that this study will provide better understanding of the basic principle of operation of QD based devices which are in the forefront of photovoltaic research.

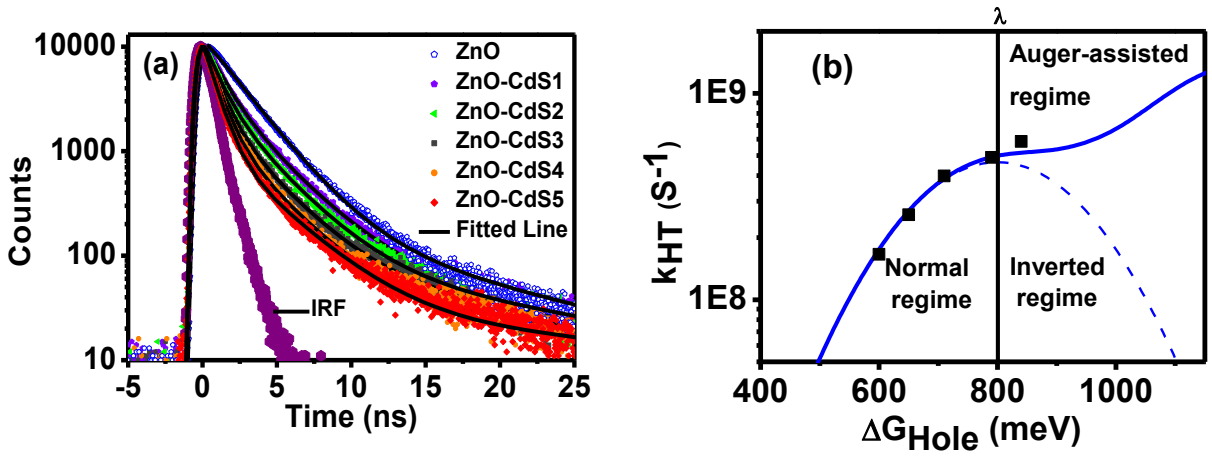

Fig 1(a) Emission kinetics of ZnO QD in presence of different size CdS QDs. (b) Driving force vs rate constant plot. Dashed line shows behavior expected from two state non-adiabatic Marcus model and solid line shows behavior expected from Auger-assisted model. Filled squares are experimental data points.

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References

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