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Long-range exciton-exciton interactions in metal-semiconductor hybrid structures ANSHU PANDEY, HSINHAN TSAI, HSING-LIN WANG, JEFFREY M. PIETRYGA, VICTOR I. KLIMOV — Establishment of long-range communication between semiconductor nanocrystals (NCs) is an important step towards their use in real-life devices. Most research towards enhancing inter-NC coupling has followed two strategies: attempts to enhance charge transfer rates in NC assemblies, and enhancement and control of energy transport via exciton transfer. We have explored the second strategy for obtaining strong coupling between distant NCs. For this purpose, we have studied the optical properties of colloidal NCs tethered to spherical gold particles coated with a silica shell. These structures exhibited clear signatures of long range coupling between the NCs which manifested in the form of cooperative decay of excitons separated by large distances (up to 40 nm apart). We further show that this coupling does not alter the overall emission efficiency of the excitons, though it significantly modifies emission rates. The observation of this regime of exciton interaction has potential applications in existing NC based devices such as lasers, and may also lead to novel applications that involve defect-tolerant energy transfer between distant chromophores

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