The pump-probe study of Intraband of OLA-HgS Quantum dot

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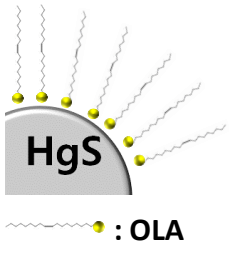
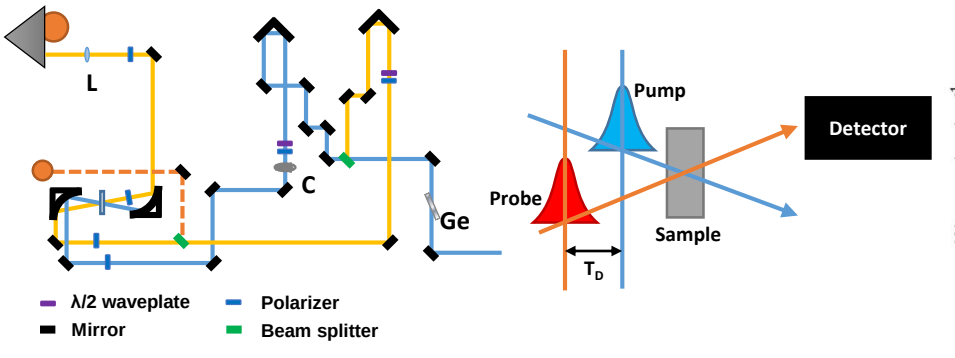
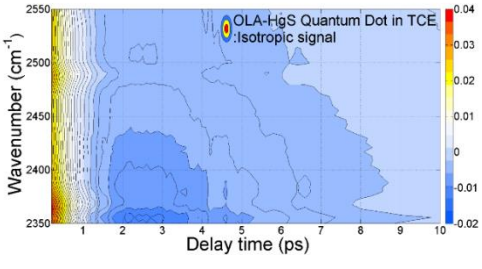
Introduction



The HgS Collidal Quantum Dots(CQDs) with Mid-IR intraband gap can be a candidate for IR photodetecting materials as well as sources of Infrared light. Here, we reported the ultrafast energy transfer and relaxation dynamics of Oleylamine-doped HgS CQDs which have size-dependent intraband gap. By using IR pump-probe techniques, we observed frequency-independent fast decaying dynamics (1.2 ± 0.1ps) accelerated by Auger process in CQDs with multi-carrier generation and decay process (16.7 ± 2.2 ps) caused by Phonon bottleneck for CQDs with single photon absorption. Moreover, transient absorption signal is observed, and assigned to the energy transfer from CQDs to the external acceptor which is solvent mode (5.8 ps for CCl_4 and 2.8 ± 0.2 ps for TCE) in this measurement.

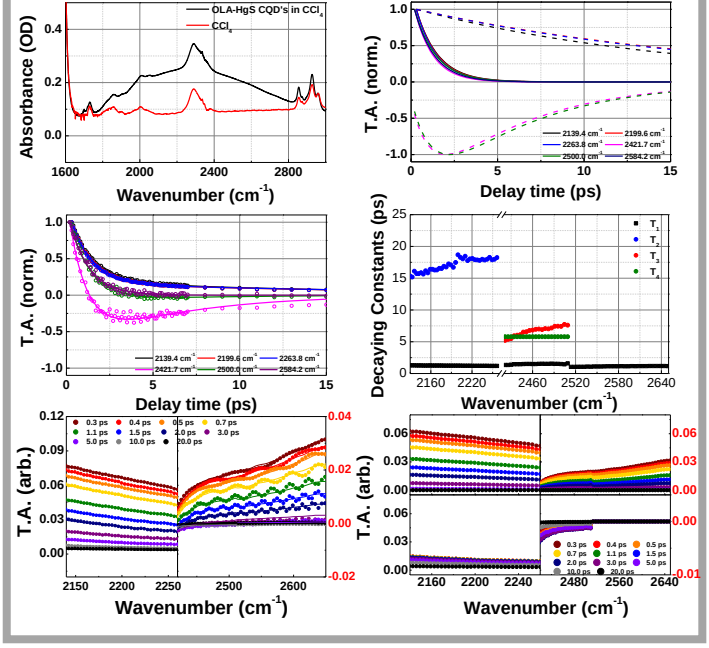
Experimentals



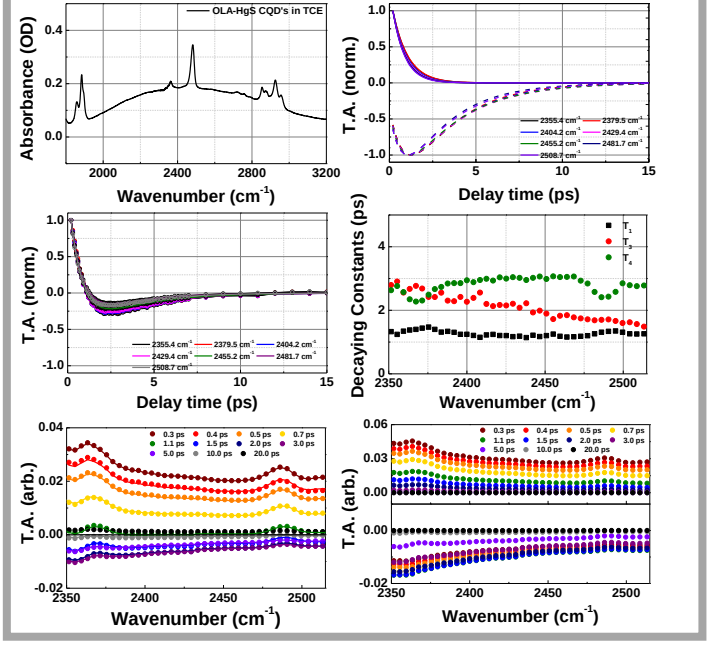


Experimental Results

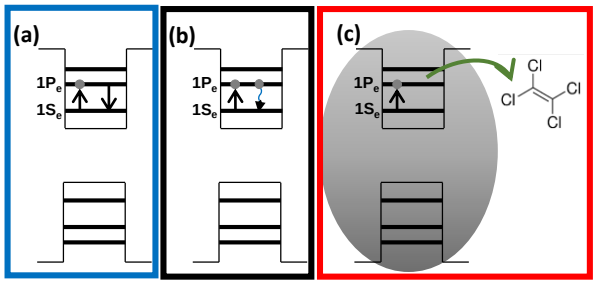
In CCl_4



In TCE



Conclusion & Discussion



We can observe 3 decaying processes

(a) Slow relaxation process caused by Phonon Bottleneck (16.7 ± 2.2 ps)

(b) Fast decaying process by Multi-carrier generation (1.2 ± 0.1 ps)

(c) Energy transfer from CQD's to solvent peaks (freq. & solvent-dependent) and its relaxation (5.8 ps (CCl_4) and 2.8 ± 0.2 ps(TCE))