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Supporting information

Physical properties of host glass and Q-CdS - glass

Table S1 Properties of the glass material

Properties	Host glass (without CdS)	Q-CdS-glass
Transition temperature (Tg in ºC)	578	580
Thermal expansion (10^{-6}/K)	11	11
Chemical stability	Good	Good

Table S2 Compositional variations in Q-CdS-glass formation and the corresponding observations

Sr. No	**Composition (wt %)**	**Observations**
1	SiO2 : 53.47,Na2O : 13.66, K2O : 14.5, ZnO : 9.00, BaO : 7.37, B2O3 – 1-2% (CdS : 0.1 to 5)	Phase separation. Composition is not uptaking even 0.1 % CdS. But without CdS, if composition is melted, transparent perfect glass is obtained.
2	SiO2-63, Na2O: 3, K2O: 16.5, B2O3-7.5, Al2O3-0.5, TiO2-1, Li2O-2, ZnO-0.5	Clear glass is obtained without CdS. But if tried with CdS, it leads to phase separation (no

	(CdS: 0.4-10.0)	glass formation)
3	SiO2-49, Na2O: 3, K2O: 21.5, B2O3-5.5, TiO2-2, BaO-5.5, ZnO-13.5 (CdS: 0.5-1.5) + Sulfur	Clear glass is obtained without CdS uptaking. With CdS, it yields glass but after heat treatment heavy precipitation (ceramic) is caused.
4	Optimized composition mentioned in the paper	Good glass and perfect nanocrystal growth throughout the glass..

Inferences

From this vigorous exercise, we obtained the following inferences.

(1) As silica content increases in glass, CdS incorporation gets suppressed. At low content of silica in composition, it gives precipitation of CdS and other oxides after heat treatment. In this case *in-situ* CdS growth is very fast (it yields ceramic like appearance). In the composition of higher silica content, *in-situ* CdS growth is very low. *In-situ* growth of CdS is thus dependent on the composition.

(2) In some of the cases we could not achieve color to the glass. The reason behind is that these compositions do not uptake CdS in matrix. Since, CdS is not in the glass, there is no crystal growth.

(3) We optimized silica content along with other ingredients in glass in melting process together with CdS and its crystal growth. Since, CdS is homogenized properly in the glass matrix (at optimum composition) during melting, monodispersed CdS nanocrystals are obtained. Due to the presence of glass domain around, spherically shaped monodispersed CdS quantum dots formed are stabilized.

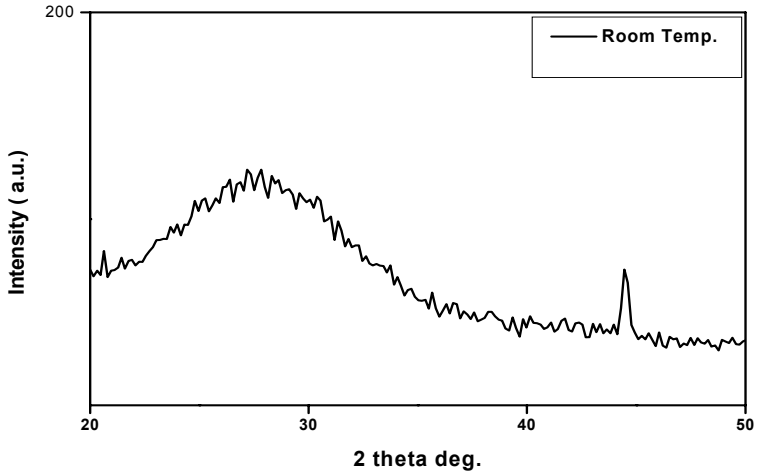

Fig. S1 XRD of reused Q-CdS-glass powder after three times photodecompositions (Peak at $2\Theta = 45^{o}$ is due to Al sample holder)

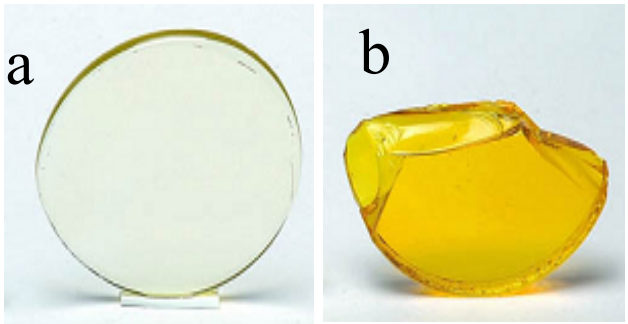

Fig. S2 Typical photographs of glass matrix, a) before crystal growth of CdS and b) after crystal growth of CdS