Electronic Supplementary Information

Reversible temperature-dependent photoluminescence in a semiconductor quantum dot for development of smartphone-based optical thermometer

Partha Kumbhakar[a], Abhirup Roy Karmakar[c], Gour Prasad Das[b,c], Jayjeet Chakraborty[d], Chandra S. Tiwary[b]*, Pathik Kumbhakar[a]*

[a]Nanoscience Laboratory, Department of Physics, National Institute of Technology Durgapur, 713209, India

[b]Metallurgical and Materials Engineering, Indian Institute of Technology Kharagpur, Kharagpur-721302, India

[c]Centre for theoretical studies, Indian Institute of Technology Kharagpur, Kharagpur-721302, India

[d]Department of Computer Science and Engineering, National Institute of Technology Durgapur, 713209 West Bengal, India

*Corresponding author: E-mail: pathik.kumbhakar@phy.nitdgp.ac.in &
nitdgpkumbhakar@yahoo.com, cst311@gmail.com*

Supplementary Information

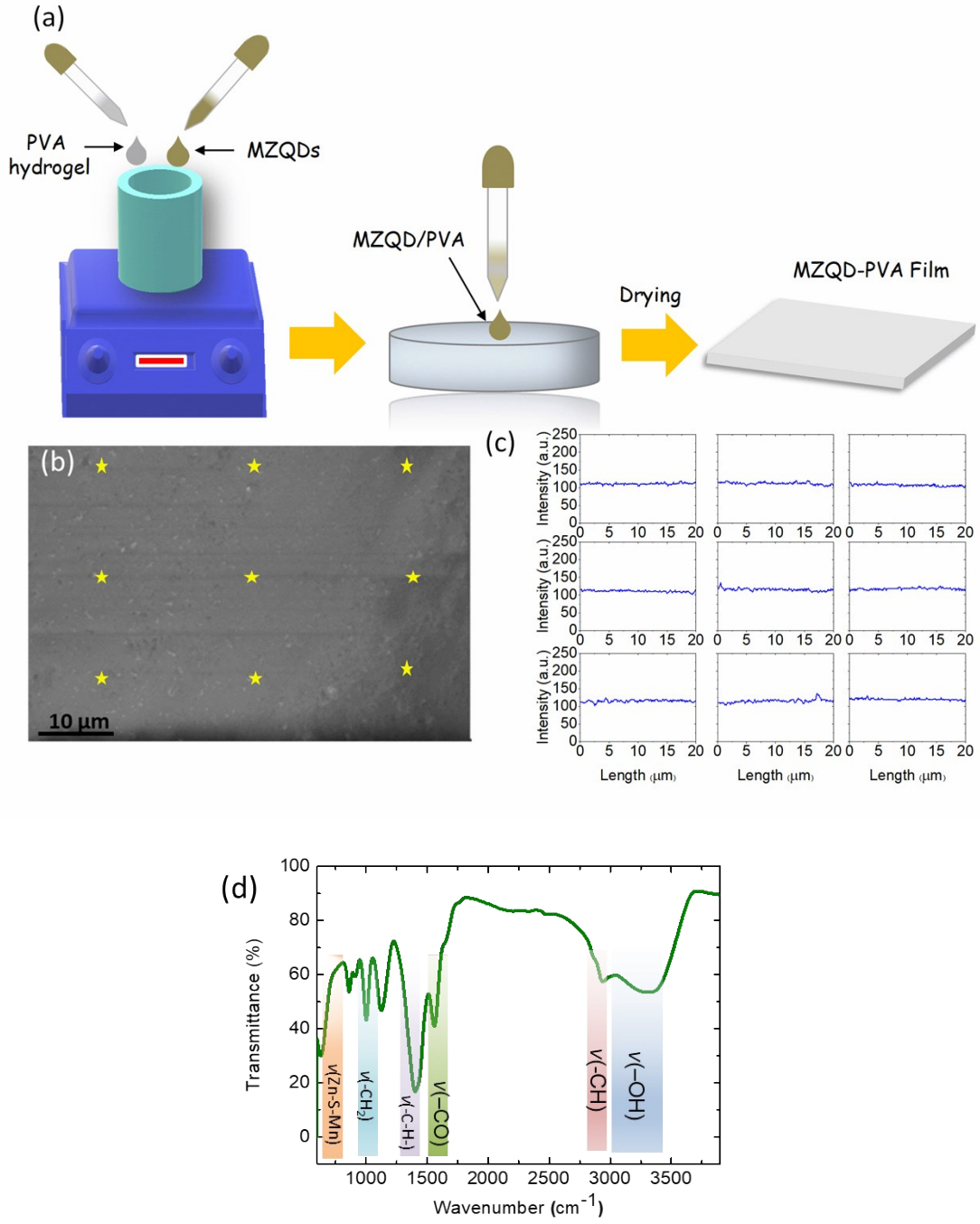

Fig. S1(a) A schematic representation of the preparation technique for the MZQDs polymer sensor films. (b) SEM image of the polymer film with the line scanning points (yellow star). (c) Gary scale line profile plots at the corresponding (yellow star) positions in the polymer film. (d) Room temperature FTIR spectrum of the MZQD film.

The broad absorption peak appeared at around 3400 cm^{-1} has been observed and it is due to the presence of –OH group in the sample. The vibrational peak at ~2933 cm^{-1} has been assigned due to the C-H stretching mode. Other typical peaks, such as at 1561, 1405, 1140 and 1002 cm^{-1} are assigned to the vibration of C=O, -CH-, $-CH_2$ and C-O groups, respectively. The characteristics narrow peaks at 700-600 cm^{-1} are due to Zn-S and ZnS-Mn stretching.

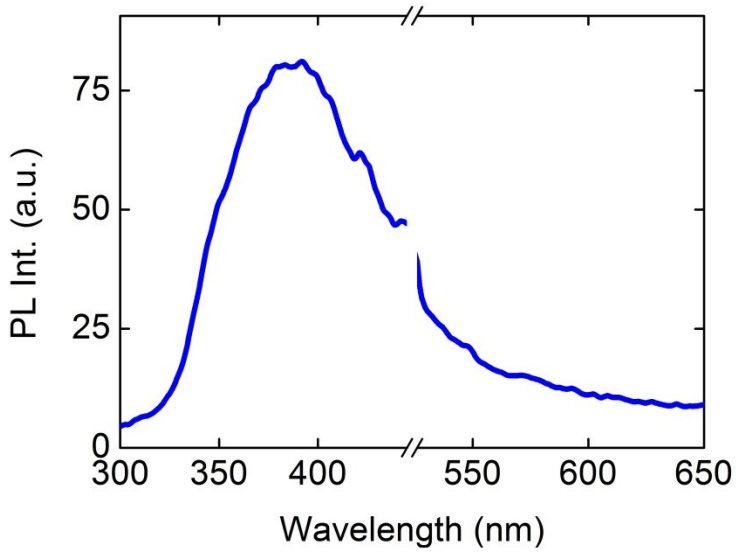

Figure S2. PL emission spectra of un-doped ZnS nanoparticles

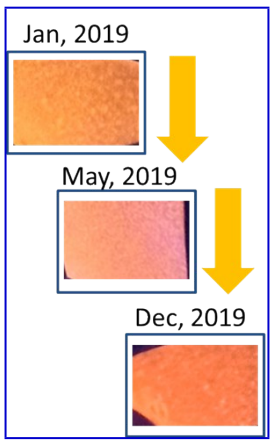

Figure S3. Demonstration of long term stability of MZQD-PVA film sensor.

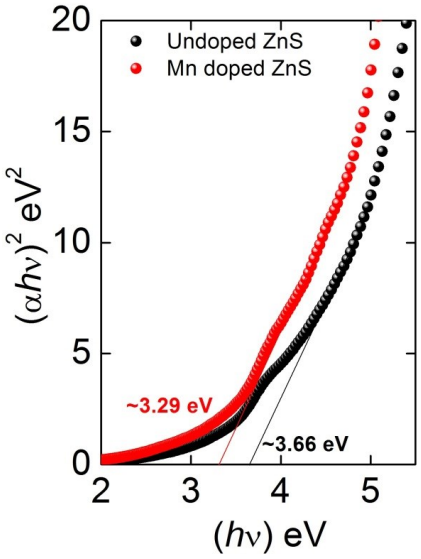

Figure S4. The plot of $(\alpha hv)^2$ versus hv of undoped ZnS and Mn doped ZnS nanoparticles.

Table S1 Temperature sensing property based on luminescence materials.

Materials	Temperature range	Sensitivity	Ref
Ag/ZnO/Er^{3+}:$YbMoO_4$ composite film	300 to 650 K	0.01574 K^{-1}	S1
$Zn_{1-x}Mn_xSe$–ZnS–CdS–ZnS	133 to 373 K	0.0083 K^{-1}	S2
LaOBr: Ce^{3+}, Tb^{3+} phosphor	293 to 473 K	0.014 K^{-1}	S3
$KMnF_3$:Yb^{3+}/Er^{3+}	303 to 343 K	0.057 K^{-1}	S4
Terbium-based metal–organic framework (TbTATAB)	100 to 300 K.	0.0448 K^{-1}	S5
MZQDs	302 to 419K	0.1642 K^{-1}	This Work

Table S2 Time dependent estimated values of RGB and color intensity of the sensor film

Time	R	G	B	ΔR	I	ΔI
Jan, 2019	255	147	71	--	176	--
May, 2019	248	160	124	2.75%	164	6.8%
Dec, 2019	249	155	105	2.35%	156	11.4%

References

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