

Supplementary Material (SM)

Self-assembled albumin decorated MoS₂ aggregates and photo-stimuli induced geometrical switching for enhanced theranostics applications

Lakshmi Narashimhan Ramana, Rajeev J. Mudakavi, Ashok M. Raichur*

Department of Materials Engineering, Indian Institute of Science, Bangalore, 560012,
India

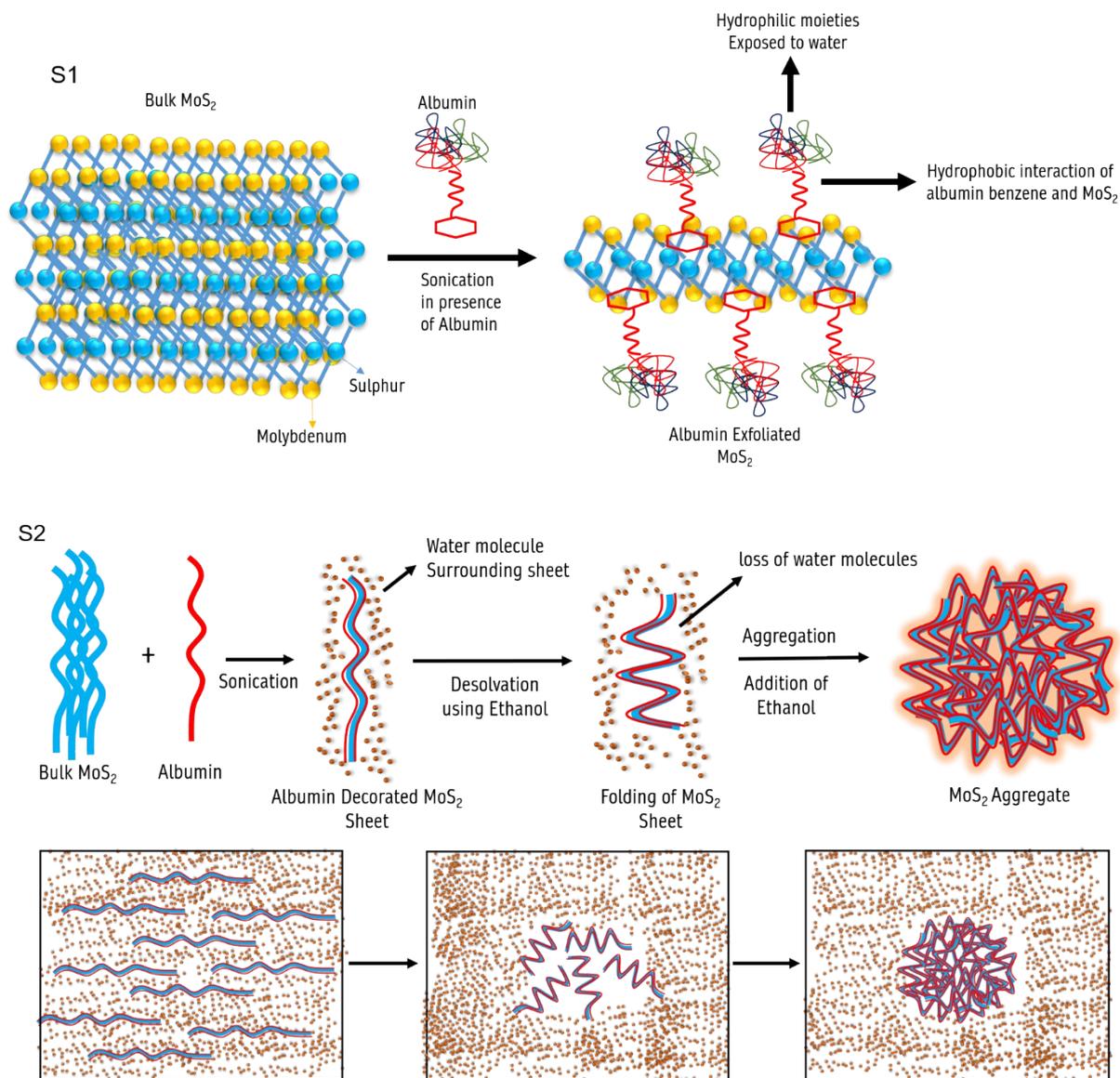
Corresponding author

*Email: amr@iisc.ac.in

Phone: +91-80-2293 3238

SM1) MoS₂ aggregate formation

The protocol for albumin assisted MoS₂ exfoliation has been reported earlier in literature is shown schematically in Figure S1. The non-polar region of albumin protein, such as disulphide bonds associate with molybdenum sheets by hydrophobic interaction and stabilize the sheets²⁴. The other part of the protein, containing hydrophilic groups, aids in the dispersion of the sheets. When ethanol is added as a desolvating agent, the water close to the MoS₂ sheets is removed thus causing the sheets to come close together and fold together taking the shape of an aggregate. The formation of MoS₂ cotton-candy like aggregates is shown schematically in Figure S2.



Supplementary Figure S1) Schematic representation of MoS_2 sheets interaction with albumin and S2) Mechanism of formation of MoS_2 aggregates

Supplementary material Table SM2

Zeta potential

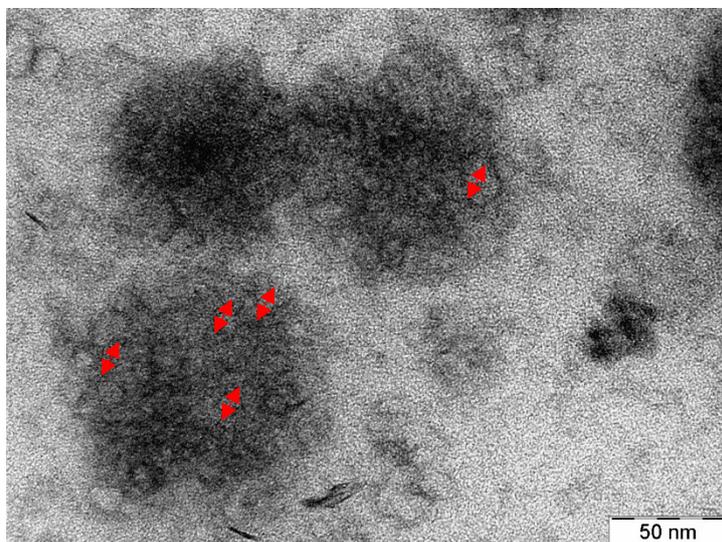
Sino	Sample	Zeta Potential (mV)		
		Aqueous Environment		10% Foetal Calf serum
		Initial	4 h	4 h
1	MoS ₂ Sheets	-40 ± 7	-37 ± 1	-33 ± 4
2	MoS ₂ Aggregates	-20 ± 1	-18 ± 1	-9 ± 1
3	MoS ₂ Aggregates +IR	-30 ± 3	-29 ± 3	-24 ± 2

Average Hydrodynamic Radius

Sino	Sample	Average Hydrodynamic Radius (nm)		
		Aqueous Environment		10% Foetal calf serum
		Initial	4 h	4 h
1	MoS ₂ Sheets	240 ± 8	260 ± 9	283 ± 17
2	MoS ₂ Aggregates	141 ± 16	145 ± 10	213 ± 5
3	MoS ₂ Aggregates +IR	284 ± 11	295 ± 5	304 ± 7

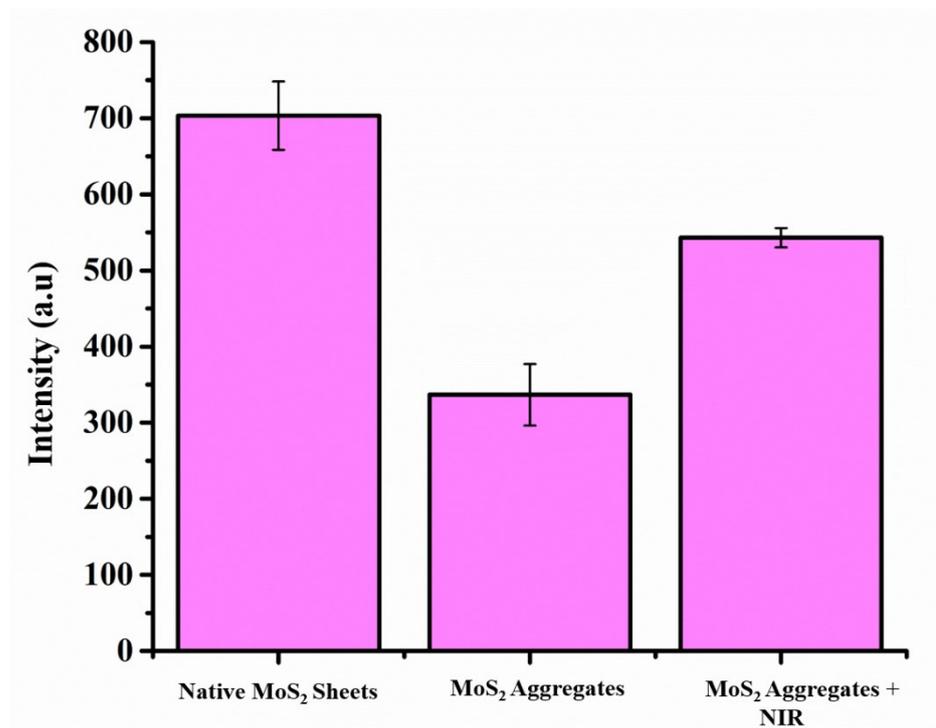
Supplementary Table SM2: Zeta potential and Average hydrodynamic radius of MoS₂ samples

Supplementary material SM3



Supplementary Figure S3: TEM image of voids observed in MoS₂ aggregates

Supplementary material SM4



Supplementary Figure S4: Photoluminescence intensity of MoS₂ samples

Supplementary material SM5

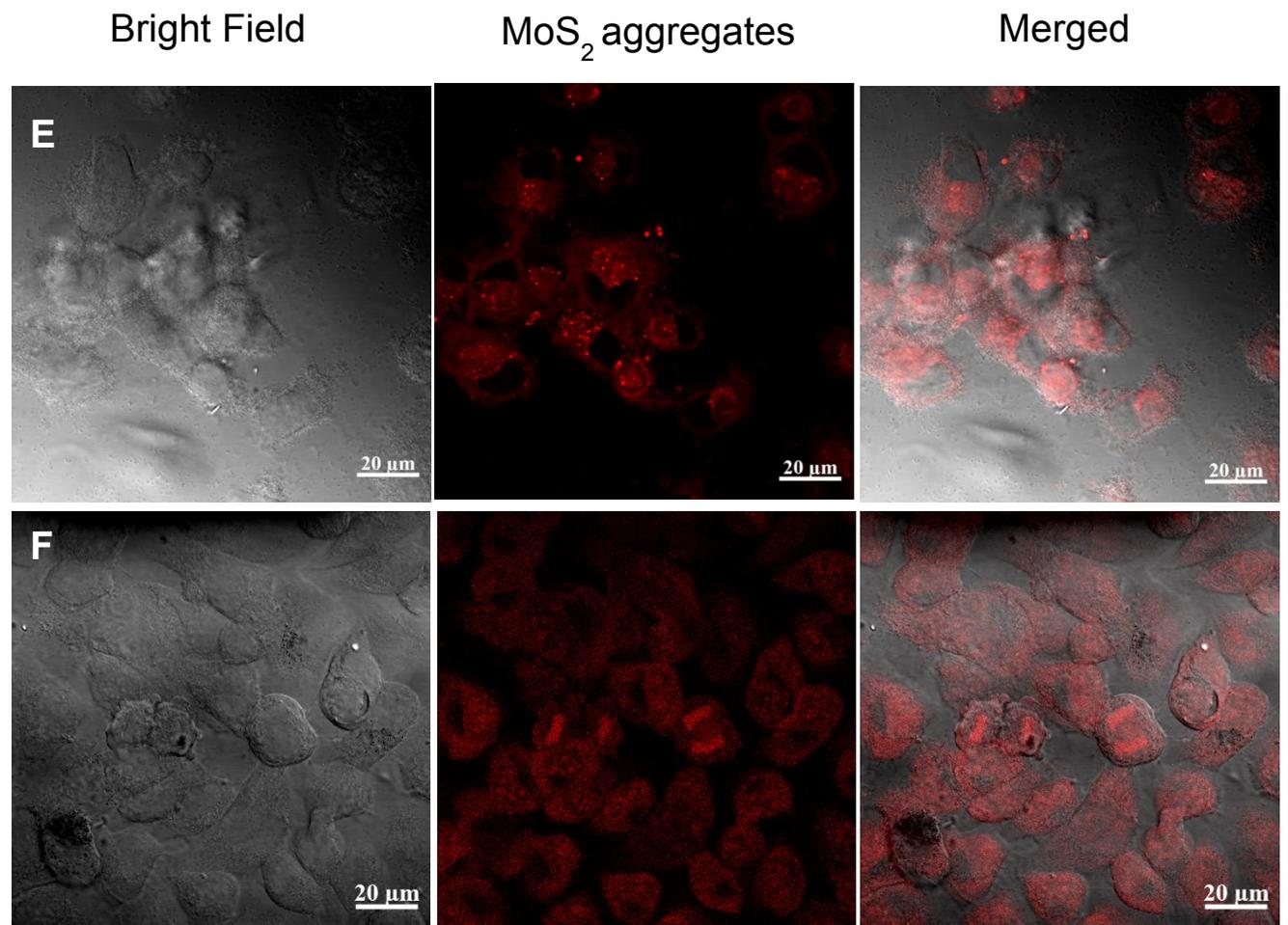


Figure S5: Confocal image of MoS₂ treated HeLa cells (E) MoS₂ aggregates incubated cells irradiated with NIR for 3 min (F) MoS₂ aggregates incubated cells irradiated with NIR for 4 min

Supplementary material SM6

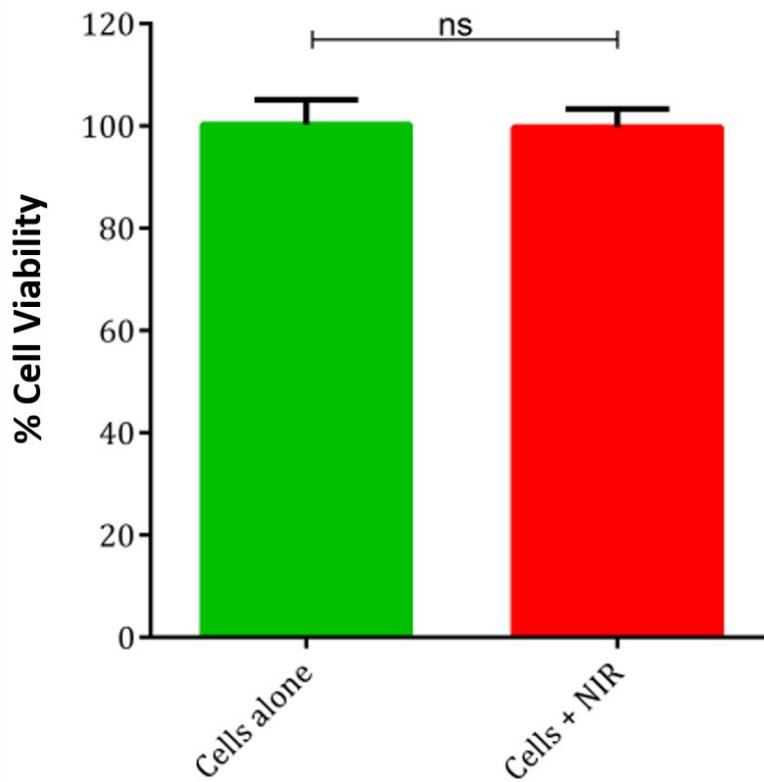


Figure S6. Comparison of cellular viability of HeLa cells after NIR irradiation. There was no observed toxicity associated with NIR irradiation alone