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Colloidal Synthesis of Ultra-Large InAs Quantum Dots

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The number of applications which operate in low or even no lighting conditions is increasing rapidly. Examples are smartphone industry, automotive engineering, enhanced vision, and automated material sorting. Indium Arsenide (InAs) Semiconductor Quantum Dots (QDs) are highly promising, RoHS-compliant candidates for infrared (IR) applications, which require much lower manufacturing costs compared to the well-known material for IR-sensing, the InGaAs.[1] However, the synthesis of larger InAs QDs above ~ 13 nm[2], optically active in the IR range above ~ 1,850 nm[2], has not been reported.
Here, we present novel colloidal synthesis methods to produce high-quality (ultra-)large InAs QDs with record-breaking sizes up to ~ 40 nm. These QDs exhibit high crystallinity and show stacking behaviour, which is essential for layer-processing applications such as sensors. Using our controlled method, we can produce single, non-elongated quantum dots in a defined manner, with a tunable band gap deep in the IR, reaching values even above ~2,600 nm.

[1] M. Ackerman, *J. Inf. Disp.* **2020**, 36(6):19-23.
[2] M. Kim et al. *J. Am. Chem. Soc. 146*, **2024**, 10251–10256.

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