

## Indium Phosphide Quantum Dots synthesized with Aminophosphines: Mechanistic Insights

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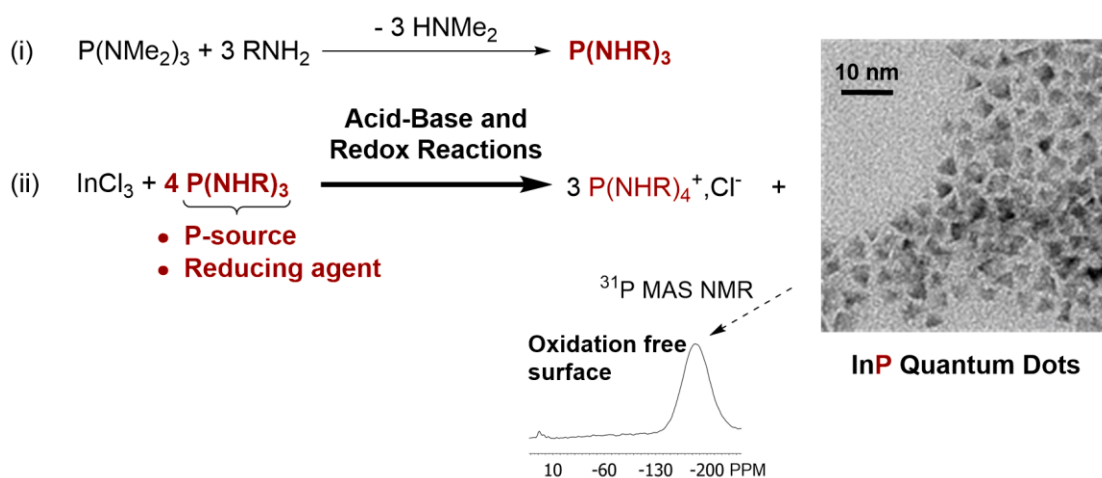
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The synthesis of indium phosphide quantum dots (InP QDs) has attracted large interest since the 1990s.<sup>1</sup> In particular, they are considered more environmentally friendly than cadmium containing QDs, and allow biological applications. Classical synthesis of InP QDs necessitate the use of indium carboxylate and P(TMS)<sub>3</sub>, a pyrophoric and expensive reagent, thus limiting the applications to the lab scale.

Since 2013, a new methodology using P(NMe<sub>2</sub>)<sub>3</sub> and In halides has been developed.<sup>2,3,4</sup> This is a significant improvement since P(NMe<sub>2</sub>)<sub>3</sub> is much cheaper and easier to handle than P(TMS)<sub>3</sub>. However, the precise mechanism of this reaction has never been elucidated.

We have devised a combined molecular and material approach to solve this problem. In particular, we have studied the mechanism of formation of the InP QDs by observing the molecular species using <sup>31</sup>P NMR and mass spectroscopy. This study highlights the crucial role of oleylamine, which serves as solvent, ligand and reagent. Moreover, we rationalize for the first time the need of an excess of aminophosphine which plays the role of both phosphorus source and reducing agent. In this talk, we will present the results of our mechanistic investigations and the surface chemistry of the InP QDs synthesized with aminophosphines.<sup>5</sup>



<sup>1</sup> For a review: Tamang S., Lincheneau C., Hermans Y., Jeong S., Reiss P., *Chemistry of InP Nanocrystals Syntheses*, Chem. Mater. 28, 2491–2506, 2016

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<sup>3</sup> Tessier M. D., Dupont D., Nolf K, De Roo J., Hens Z., *Chem. Mater.* 27, 4893–4898, 2015

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<sup>5</sup> Buffard A., Dreyfuss S., Nadal B., Heuclin H., Xiangzhen X., Patriarche G., Mézailles N., Dubertret B., *Manuscript submitted*