

**IN THE UNITED STATES DISTRICT COURT  
FOR THE EASTERN DISTRICT OF TEXAS  
MARSHALL DIVISION**

NANOCO TECHNOLOGIES LTD.,

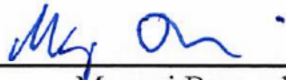
v.

SAMSUNG ELECTRONICS CO., LTD., and  
SAMSUNG ELECTRONICS AMERICA,  
INC.

Civil Action No. 2:20-cv-00038-JRG

**JURY TRIAL DEMANDED**

**REBUTTAL EXPERT REPORT OF MOUNGI BAWENDI, PH.D.**

  
By: Moungi Bawendi, Ph.D.  
Date: June 10, 2021

[REDACTED]

130. At least for the reasons I stated above, it is my opinion that zinc oxo clusters, including those having the general molecular formula  $Zn_4O(O_2CR)_6$ , do not form in the processes used by Hansol Chemical to make Samsung's quantum dots.

### **XIII. SYNTHESIS OF INDIUM PHOSPHIDE-BASED QUANTUM DOTS**

131. Dr. Cossairt cites to one of my publications as support for “the importance and persistence of InP clusters during the synthesis of InP QDs [*i.e.*, quantum dots] directly from molecular precursors (*i.e.*, indium carboxylate and  $P(TMS)_3$ ).”<sup>175</sup> Specifically, Dr. Cossairt states that my research group “showed using MALDI mass spectrometry that InP clusters are persistent during QD growth, even at high temperatures.”<sup>176</sup> Dr. Cossairt states that, “[i]n many cases, clusters were present throughout the entire reaction period whether they were formed in a single or two-step synthesis” and that “[t]his observation led to the conclusion that these clusters play an important role ‘as a supply for the formation of larger InP particles’ and that there is a ‘strong dependence of QD formation on the cluster’s existence.’”<sup>177</sup>

132. To begin, Dr. Cossairt overlooks that, while my publication discusses the formation of certain “clusters,” those are not molecular cluster compounds as defined by the Court in this case.<sup>178</sup> The publication expressly states that “small cluster *mixtures* with masses around 10 kDa” may form under certain reaction conditions.<sup>179</sup> At least because these “clusters” are not identical

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<sup>175</sup> Cossairt ¶ 67 (citing NANOCO\_00097632, Lisi Xie et al, *Characterization of Indium Phosphide Quantum Dot Growth Intermediates Using MALDI-TOF Mass Spectrometry*, 138 J. AM. CHEM. SOC'Y 13469 (2016) (“Bawendi 2016”)).

<sup>176</sup> Cossairt ¶ 67.

<sup>177</sup> Cossairt ¶ 67 (quoting Bawendi 2016).

<sup>178</sup> *See supra* § IV.B.

<sup>179</sup> Bawendi 2016, 13470.

[REDACTED]

to one another such that all molecules of the cluster compound possess the same relative molecular formula, the publication is not relevant to the claims of the nanoparticle patents. While the publication discusses “clusters,” this word is used to describe “nuclei” formed in a bottom-up approach that proceeds from molecular precursors to nanoparticles in solution. In other words, the word “clusters” as used in this publication is different than the Court’s construction of the claim term “molecular cluster compound,” and the nuclei referred to in this publication are not molecular cluster compounds under the Court’s construction.<sup>180</sup>

133. Further, the publication expressly notes that, under certain conditions where such “clusters” form, they no longer exist after 8 minutes at 270°C.<sup>181</sup> The publication does not indicate the temperature required to form such “clusters” in the first instance. And while it is possible that such “clusters” may form under certain reaction conditions in the formation of InP quantum dots, the studies of this publication did not involve [REDACTED] processes that may alter the reaction pathway to quantum dots.

134. Finally, the publication recognizes the ability to form cluster-free quantum dots. Specifically, my coauthors and I reported that our study shows “cluster-free InP QDs” can be formed using high temperatures and long reaction times.<sup>182</sup> Therefore, it is entirely possible to form InP-based quantum dots without the formation of “clusters” (let alone molecular cluster compounds) by modifying reaction conditions such as temperature, reaction time, and

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<sup>180</sup> See *supra* § IV.B.

<sup>181</sup> Bawendi 2016, 13470.

<sup>182</sup> Bawendi 2016, 13470; see also Bawendi 2016, 13471 (characterizing cluster-free InP QD solutions).