GESELLSCHAFT DEUTSCHER CHEMIKER
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Ortsverband Südwürttemberg

V O R T R A G

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The Dream of the Perfect Nanocrystal

Thanks to extensive research over 30 years, quantum dots are now commercially used as fluorescent materials in displays. However, even the best quantum-dot syntheses yield samples with distributions in particle size and shape. Because this reduces optical performance for applications, a dream of researchers has been to eliminate such distributions. But can we achieve a sample of semiconductor nanocrystals in which all particles are identical? Here, we will discuss this possibility by examining two relevant classes of nanocrystals. First, we will consider thin rectangular particles known as semiconductor nanoplatelets. Amazingly, nanoplatelet samples can be chemically synthesized in which all crystallites have the same atomic-scale thickness (e.g., 4 monolayers). This uniformity in one dimension suggests that routes to perfect samples can exist. After unraveling the underlying growth mechanism for nanoplatelets, we turn to the possibility of uniformity in all three dimensions. This leads to the second class of nanocrystals—magic-sized clusters. Long known to appear in certain nanocrystal syntheses, magic-sized clusters are believed to be molecular-scale arrangements of atoms with a structure that is more stable than particles slightly smaller or larger. Unlike quantum dots, magic-sized clusters grow by jumping between a series of discrete “magic” sizes. While these species can in principle be uniform in size and shape, they have been poorly understood. Especially puzzling are experiments that have tracked the discrete evolution of magic-sized nanocrystals to sizes well beyond the “cluster” regime. We will resolve this dilemma by presenting the growth mechanism of magic-sized clusters. We will then conclude by discussing whether this understanding can lead to perfect semiconductor nanocrystals.

Donnerstag, **16. Januar 2025, 17.15 pm**
Hörsaal N05, Auf der Morgenstelle 16

gez. Ivana Fleischer