Water transferred semiconductor nanoplatelets as ultra-bright fluorescent probes

Henry Halim[1], Ingo Lieberwirth[1], Kaloian Koynov[1], Andreas Riedinger[1]

[1]*Max-Planck-Institute for Polymer Research, Ackermannweg 10, 55128 Mainz, Germany*

Quasi-two dimensional semiconductor nanoplatelets (NPLs) exhibit high spectral brightness and large absorption cross sections [1], [2], making them promising for various applications including bioimaging. However, the synthesis of NPLs takes place in organic solvents, therefore they require phase transfer in order to use them in aqueous environments. The phase transfer of NPLs has so far been challenging with few examples in literature [3], [4], [5]. This is likely due to the facile agglomeration of materials with plate-like geometries during the coating procedure. Here we demonstrate how to overcome agglomeration and transfer NPLs, individually coated with amphiphilic polymer chains, to aqueous phase. Upon one and two-photon excitation the water transferred NPLs exhibit more than two fold higher fluorescent brightness relative to commercially available quantum dots. Additionally, the polymer coating increase the stability of nanoparticles in physiological condition, which puts these nanoplatelets ideally at the forefront of the next generation ultra-bright fluorescent labels for bioimaging.

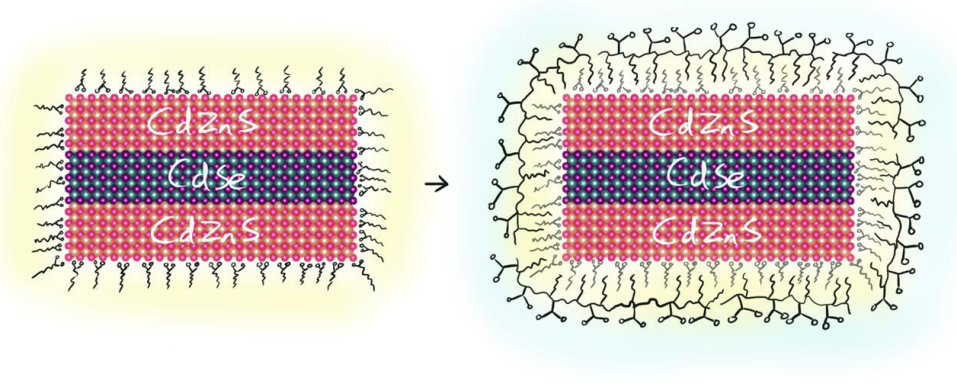

Figure 1. Illustration of polymer coating. Hydrophobic regions are highlighted in yellow.

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