

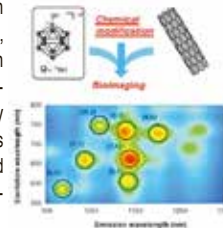


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Physical modification of carbon nanotubes with a dendrimer bearing terminal mercaptoundecahydrododecaborates ($\text{Na}_2\text{B}_{12}\text{H}_{11}\text{S}$)

The functionalization of dodecaborates has attracted much attention, both for the development of boron neutron capture therapy (BNCT), where ^{10}B nuclei capture thermal neutrons to emit ^7Li nuclei and alpha particles that destroy cancer cells. Increasing focus has been placed on the conjugation of the thiol-substituted B_{12} -cluster mercaptoundecahydro-*closo*-dodecaborate ($\text{Na}_2[\text{B}_{12}\text{H}_{11}\text{SH}]$; BSH). This is mostly due to the fact that BSH offers great biological advantages, which includes higher boron content, ionic nature, higher solubility in water, significantly lower toxicity based on its boron content, and its clinical use in the treatment of cancer (BNCT). For a boron delivery agent to be successful in BNCT, both high tumor-targeting selectivity and the possibility for in vivo imaging are required. However, reports on the conjugation of BSH with bioimaging agents remain scarce. We have successfully synthesized a new water-soluble dendrimer that bears B_{12} -cluster terminals, with potential applications in BNCT. Moreover, the physical modification of SWCNTs with boron-cluster dendrimer furnished SWCNT/(boron-cluster dendrimer) nanohybrids that exhibit NIR-I-to-NIR-II fluorescence. Further investigations into the cellular uptake and cytotoxicity of our materials are currently in progress.



Disproportionation-induced solid-state fluorescence in 6,13-dihydropentacenes

The molecular design of π -conjugated systems is crucial for the development of new functional materials. Nevertheless, reports on π -conjugated systems exhibiting disproportionation-induced photoluminescence changes are relatively rare. Against this background, we decided to explore the utility of disproportionation reactions for the development of fluorescent chromic materials. The thermally and photolytically induced disproportionation of 6,13-dihydropentacene derivatives into tetrahydropentacenes and pentacenes results in unique solid-state fluorescence. The fluorescence thereby depends on the molecular structure and the molecular arrangement in the solid state. The molecular structure and conformation in the crystals strongly influence the disproportionation reaction. Upon heating or photoirradiation of 6,13-dihydropentacene derivatives in the solid state, the fluorescence color gradually changed from bright blue to red. The solid-state fluorescence behavior induced by disproportionation may serve as an example for guided molecular engineering, providing fascinating possibilities to tune materials for sensing, as well as optical and thermal recording applications.

