One-pot ultrasound assisted functionalization of multi-walled carbon nanotubes via Diels-Alder chemistry in aqueous media

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PURPOSE OF THE ABSTRACT
One-pot ultrasound assisted method for direct functionalization of multi-walled carbon nanotubes (MWCNTs) in water was demonstrated by Diels-Alder (DA) click reaction. Firstly, well-defined polymers poly(styrene-alt-maleic anhydride) (PSM) were functionalized with furfuryl amine in water to incorporate dien groups. Then, the polymer reacted with untreated MWCNTs as dienophiles in DA reaction at 50°C under ultrasound irradiation as well as conventional heating-stirring method. Thermogravimetric analysis, infrared spectroscopy, raman spectroscopy and X-ray photoelectron spectroscopy confirm the success of the reaction and allow to estimate the grating density of polymer on MWCNTs. The results indicated that the reaction rate under ultrasound irradiation was accelerated about 12 times faster than the one under the conventional heating-stirring condition without losing the grafting efficiency. The direct functionalization of CNTs formed a stably dispersed solution in water, promising a green and effective method for industrial process.