Systematical preparation of modified grapheme quantum dot (GQD) with tunable surface property

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Systematic control of surface chemistry of graphene quantum dots (GQDs) is extremely challenging and is one of the key technologies for applying GQDs into practical use. Here we prepared surface modified GQDs with direct bonding of small molecule on GQDs. It is observed that surface property of GQDs systematically controlled depending on the amount of small molecule on GQD. Among the samples, the GQD treated with excess amount of small molecule showed highly hydrophobic property. In addition, modified GQDs can behave like both a molecular and a colloidal surfactant. In specific, surface modified GQD is capable of stabilizing Pickering emulsions of organic solvents in oil/water system and can also act as a molecular surfactant to disperse insoluble materials in water. Finally, surface modified GQDs are successfully applied as surfactant in emulsion polymerization. The ease of control of surface chemistry may offer great potential application in all system using surfactant.