

### Aggregation of graphene oxides by adsorption of peptide nucleic acid and application in DNA detection

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We investigate selective aggregation of graphene oxide (GO) in aqueous solution using the peptide nucleic acid (PNA). Addition of PNA that is a DNA analogue with a neutral polyamide backbone into the GO suspensions should result in adsorption of PNA on the surface of GO. This should make the PNA-functionalized GO neutrally charged, leading to destabilization and aggregation of GO. We used various microscopies and quasi-elastic light scattering to monitor the aggregation of GO. Furthermore, PNA-mediated GO aggregation was applied to detect mutations in DNA sequence. The PNA was designed to be complementary to the mutant type target DNA. If the mutant type target was present, double-stranded DNA was formed via hybridization between PNA probes and target DNAs, preventing adsorption of PNA onto GO surface. On the other hand, wild type target DNAs had a mismatch with PNA probes so that PNA probes could adsorb on the GO surface, leading to aggregation. Using this method, we could successfully detect mutations in DNA samples.