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Non-covalent interactions in the colloidal graphene dispersions DORSA PARVIZ, Texas A&M Univ, ZINIU YU, SRIYA DAS, FAHMIDA IRIN, RONALD HEDDEN, Texas Tech Univ, MICAH GREEN, Texas A&M Univ — We have studied stabilization mechanisms in colloidal dispersions of pristine graphene. Electrostatic and steric stabilization in presence of pyrene derivative as dispersants depends on the dispersant concentration, functional groups and the solution pH. The graphene/dispersant yield obtained by pyrene derivatives was considerably higher compared to conventional dispersants. Pyrene-graphene π-π interactions were combined with a designer functional group (polydimethylsiloxane (PDMS)) to synthesize a polymer with dual functionality as dispersant and polymer matrix. The same strategy was applied to produce graphene/ PMMA and graphene/ PS films. Controllable crumpling of graphene nanosheets was induced through rapid evaporation of dispersion droplets within a spray dryer. Dimensional transition of 2D nanosheets to 3D crumpled particles was directly observed. Multi-faced dimpled morphology of pristine graphene was different than highly wrinkled morphology of crumpled graphene oxide. Changing the compressive forces during drying allowed for controllable folding of the nanosheets, while the unfolding of the redispersed crumpled particles was controlled by the solvent choice.

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