

## Stimuli-Responsive Polymer-Integrated 2D Materials: An Effective Platform for Optical Sensing and Therapy in Real-time

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To overcome the limits of conventional polymers in sensing and therapeutic applications, we develop stimuli-responsive, fluorescent polymer grafted 2D-materials such as graphene derivatives and molybdenum disulfide nanosheets. They show fluorescence dynamics as a function of environmental stimuli (e.g. temperature, pH and metal ions) and the intrinsic 2D materials' properties as well. The fluorescent, stimuli-responsive block copolymers were precisely synthesized using RAFT polymerization. The target stimuli-dependent optical properties of the polymer nanocomposites were achieved by exploiting the switchable conformation of the polymer chains on 2D materials for tuning the Förster resonance energy transfer (FRET) between the donor and the acceptor. In addition, for useful applications using these polymer nanocomposites, the polymer-based platforms were introduced such as hydrogel thin films and semipermeable microcapsules, demonstrating their potential as the next-generation of in-situ sensing and therapy agent.