Design of amplifying fluorescent conjugated polymer sensors based on higher energy gap control concept

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Abstract: Chemo- and biosensors based on fluorescent conjugated polymers benefit from greater detection sensitivity due to amplification of the electronic perturbations produced by analyte binding. This amplification stems from the exciton-transporting properties of conjugated polymers. A conventional design paradigm relies on the analyte binding events which generate sites of lower energy relative to the polymer energy gap: either fluorescence quenching sites (*turn-off* sensors) or bathochromically shifted fluorophores (*turn-on* sensors). In both type sensors, the excitons migrate to the lower-energy sites created by analyte binding. Currently, we are investigating an alternative paradigm when analyte binding creates **higher energy gap** sites in the polymer backbone. Such higher-energy gap sites act as 'roadblocks' for excitons to reduce their migration length. Decreasing exciton migration length is accompanied by increasing fluorescence intensity, thus generating an amplified *turn-on* fluorescent response. The new paradigm expands the generality and universality of the signal amplification concept in conjugated polymers, and can be used to design amplifying *turn-on* fluorescent sensors for various practically useful analytes. This presentation with specifically outlines our recent development of sensor for hydrogen sulfide in biological environment.