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Abstract: In this work, we presented the robust and magnetically recoverable dual sensor particles that are capable of real-time monitoring of dissolved oxygen (DO) and glucose concentrations in aqueous solutions. The dual sensor consists of glucose oxidase-functionalized polyethylenimine-coated Fe₃O₄ particles (Fe₃O₄@PEI-GOD) and sub-micro-sized Fe₃O₄-modified poly(Platinum porphyrin-co-Styrene) ((PtTFPPMA-PS)@Fe₃O₄) fluorescent spheres. The dual sensing functions originate from the cascade catalysis amplification driven by the recyclable Fe₃O₄@PEI-GOD particles and glucose oxidase consumption of oxygen in the process of glucose oxidation. Consequently, the (PtTFPPMA-PS)@Fe₃O₄ fluorescent spheres exhibited higher fluorescence intensity due to the effective alleviation of fluorescence quenching effect raised from the decrease of DO. The remarkable fluorescence intensity-changing characteristics of the solutions facilitate convenient identification of oxygen concentrations and glucose concentrations even with naked eyes. Thanks to the magnetically recoverable superiority, the recycle study proved that the multifunctional particles could be repeatedly utilized without significant catalytic activity loss after 10 cycles. Interestingly, the sensing film comprising the (PtTFPPMA-PS)@Fe₃O₄ fluorescent spheres can also be applied to the unsteady pressure measurement and unsteady air flow visualization due to its remarkable light intensity-changing features.

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