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(57) Abstract :

The present invention relates to that the design of an immobilization process for an oxygen-sensitive ruthenium-based fluorescent dye with applications in microscale biological, chemical and environmental sensing. The dye immobilization system consists of pre-mixing the dye with an electrostatically charged polyion in solution that acts as a binding matrix to attach the dye molecules to a surface-charged substrate. The substrate surface charge is reversed, and another polyion in solution is used to reverse the surface charge to make possible further dye-polyion adsorption. The dye-polyion-coated substrates were characterized using QCM, absorbance spectrophotometry, fluorescence spectroscopy, SEM imaging and oxygen sensitivity testing to determine the characteristics and functionality of the immobilized dye layers. The dye immobilization technique was demonstrated to be stable and repeatable and calibration of the oxygen sensitivity was also performed. The dye exhibited characteristic Stern-Volmer oxygen sensitivity, with unprecedented sensing resolution over previous optical oxygen sensing schemes.

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