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Fast Response Oxygen Micro-Optodes Based on Novel Soluble Ormosil Glasses

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Abstract:

A new type of phenyl substituted ormosils as a matrix for oxygen-sensitive micro-optodes is described. The new ormosils combine features of classical polymers such as solubility in organic solvents and those of sol-gel glasses such as mechanical stability and a porous structure. They make possible a simple and fast fabrication of microsensors with reproducible properties. The influence of the conditions during the polymerisation process (precursor composition and thermal treatment) on the sensing properties has been studied in detail. Oxygen-sensitive films with ruthenium(II)-tris-(4,7-diphenyl-1,10-phenanthroline) and platinum(II)-octaethylporphyrin as indicators were characterised with respect to their mechanical and photophysical properties. Photostability, oxygen sensitivity, response behaviour and signal intensities of the sensing films and the micro-optodes were examined. Micro-optodes based on the new sensing materials are fast responding, photostable and can be produced with a sufficient batch to batch reproducibility. Compared to previously described oxygen micro-optodes, where polystyrene was used as immobilisation matrix, the new sensors can be autoclaved and show favourable properties such as a faster response and a higher sensitivity. They possess many potential applications in medical and biological research.

Key-words: Micro-optode, Ormosil, Luminescence decay time, Oxygen sensing