„PERFORMANCE OF TiO_2:Sm^{3+} BASED OPTICAL SENSOR EMBEDDED IN CAVITATED POLYMER FILMS“

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The aim of the present work is to incorporate inorganic, low cost and remotely readable trace oxygen sensor into industrial polymer packaging material with the aim to help detect package inside atmosphere instabilities after package sealing. For the purpose photoluminescent Sm^{3+} ion doped TiO_2 nanoparticles are used. The intensity of Sm^{3+} photoluminescence spectra in TiO_2 has been shown to be greatly influenced by its surrounding ambient oxygen concentration [1,2]. By incorporatin the latter into polymer packaging film, it is expected to enable remote sensing of the local oxygen concentration in the film and consequently inside the package.

In previous research an attempt was made to homogenize the sensor material particle size and synthesize dominantly nano-sized oxide spheres via liquid phase extraction method by using colloidal solutions of Ti (IV) oxysulfate in water as a precursor. First dispersion tests show proper dispersability of the oxide nanoparticles within the polymer and its ability to retain PL modulation depending on the ambient oxygen changes through the polymer film matrix.

In current work the main aim is to enhance the modulation of the optical signal from the sensor. The relative free surface area of the sensor particles is increased via a cavitation technique that introduces voids into the polymer film (an industrial process). The effects of cavitation to the signal modulation and to overall sensitivity will be characterized as well as the degree of cavitation achieved.

References

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