DETECTING TRACE AMOUNTS OF OXYGEN IN GAS ATMOSPHERE USING AN OPTICAL TiO_2 BASED SENSOR

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Photoluminescence (PL) based sensing of trace amounts (down to 50 ppm) of gaseous oxygen was studied with samarium (Sm^{3+}) doped TiO_2 anatase nanoparticles at room temperature. The TiO_2 nanopowder doped with 3 mol% Sm^{3+} was prepared via the sol-gel method. The resulting white powder is, in accordance to previous studies [1], photoluminescent in the visible region, giving a red-orange emission when excited with 355 nm laser light. The intensity of the PL emission is sensitive to changes in the ambient gas atmosphere. By using PL intensity as the response signal (as was done in [2]), gaseous oxygen can be detected in trace amounts down to 50 ppm concentration in a nitrogen gas environment, as can be seen from Fig 1.

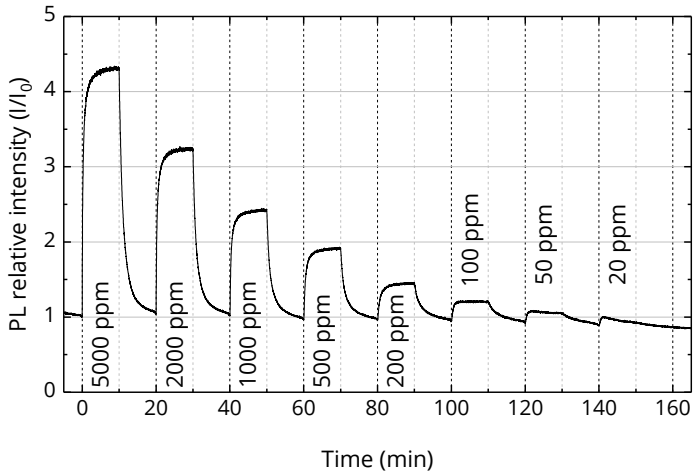

Figure 1. Oxygen sensitivity of TiO_2:Sm^{3+} photoluminescence intensity in nitrogen gas atmosphere.

A possible application for this type of oxygen sensor is inert atmosphere packaging quality assessment, where the sensor material can be placed inside the package and the readout can be acquired optically, without physically penetrating the package.

References

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