SPR sensors for the monitoring of the degradation process of Eu(dbm)3(phen) and Alq3 thin films under atmospheric and UVA exposure

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The degradation process of Tris(8-hydroxyquinoline) (Alq3) and Tris(dibenzoylmethane) mono(1,10-phenanthroline)europium(III) (Eu(dbm)3(phen)) thin films is investigated by the use AFM, photoluminescence and SPR spectroscopy. The plasmonic sensors are operated both in air and nitrogen environment where are irradiated with controlled doses of UVA radiation. AFM results don’t reveal the formation of heterogeneous phases and crystallization under air exposure. The organic thin films change their refractive index under both kind of exposures, and act as protecting layer against oxidation for the SiO2/MPTS/metal interface of the plasmonic sensors. SPR measurements reveal a strict correlation between the refractive index increase and quenching of photoluminescence of the organic thin films. Taking advantage of a simple encapsulation technique, we were able to differentiate the extrinsic degradation effects due to air and UVA controlled exposure, in terms of both PL intensity and refractive index changes. Although being subject to degradation, the AFM and SPR spectroscopy experimental results demonstrate that the organic luminescent materials don’t form heterogeneous phases under air exposure, and act as efficient protection layer for the SiO2/MPTS/Au and SiO2/MPTS/Ag interfaces. The results are promising for the development of compact plasmonic UVA dosimeters in Surface Plasmon Coupled Emission Configuration (SPCE) with lanthanides beta diketonatecomplexes materials (patent pending).