PHOTO- AND UNDER X-RAY LUMINESCENCE FROM XEROGELS EMBEDDED IN MESOPOROUS ANODIC ALUMINA

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Porous anodic alumina (PAA) films with pore and cell sizes ranging from 170 to 190 and 240 to 270 nm, respectively, have been generated on aluminum and monocrystalline silicon substrates followed by spin-on sol-gel derived coating with the subsequent thermal treatment producing microporous xerogel. The distribution of the xerogels corresponding to the chemical contents of willemite, garnet, titania, alumina, doped with terbium and strontium in PAA was investigated. Most xerogels, after annealing at 1000 °C, are mainly distributed near the pore bases, leaving much of the pore volume unfilled.

The distribution of yttrium aluminum composite in PAA is compared for sol-gel and co-precipitation methods. The xerogel/PAA structures reveal terbium-related luminescence under ultraviolet and X-ray excitation, with the strongest luminescence in the direction along the channels of the pores. The same xerogels generated on monocrystalline silicon reveal no luminescence under X-ray and weaker photoluminescence.

Thus, PAA enhances photo- and under X-ray luminescence from terbium doped xerogels. The fabricated structures are considered as a type of low-cost, thin-film convertor of X-ray irradiation into visible light, with an average cell size of the convertor of about 250 nm. Examples of polychromatic luminescent images on the basis of porous anodic alumina are also presented.