Persistent luminescence of Rare Earth doped materials prepared by sol-gel method

Otávio Pereira Bezzan[1], Cássio Cardoso Santos Pedroso[1], José Miranda Carvalho[1], Maria Cláudia França da Cunha Felinto[2], Hermi Felinto Brito[1], Jorma Hölsä[3,1], Lucas Carvalho Veloso Rodrigues[1]

[1]Instituto de Química-Universidade de São Paulo, [2]Instituto de Perquisas Energéticas e Nucleares, [3]University of Turku / Turun yliopisto

e-mail: otavio.bezzan@usp.br

Persistent luminescence materials are the subject of considerable research for several applications as heat and pressure sensors, biosensors and emergency lights [1]. Many materials are available in literature based on different emitters as Eu^{2+}, trivalent rare earths (R^{3+}), Mn^{2+}, Ti^{3+} etc. For example, cadmium silicate and calcium titanate yield different emission colors with different R^{3+} dopants [2]. Normally, these materials are prepared with the solid state method needing high temperatures during long calcination times and. In order to apply the materials as thin films, the particle size should be reduced. In the sol-gel method it is possible to obtain materials with better control of stoichiometry, homogeneity and smaller particles sizes. In addition, this method normally uses lower temperatures compared to the traditional methods. This work deals with the preparation of persistent materials $CdSiO_3$:R^{3+} (R: Tb, Pr, Sm and Gd) and $CaTiO_3$:R^{3+} (Pr^{3+}, Dy^{3+}) by sol-gel method.

The X-ray diffraction confirms the phase purity for all materials without impurities of segregation due to R^{3+} doping. The scanning electron microscopy show that the materials have smaller particles than those prepared with conventional synthesis. The $CdSiO_3$:R^{3+} materials exhibit different persistent luminescence colors with different dopants as green (Tb^{3+}), red (Pr^{3+}), pink (Sm^{3+}) and blue (Gd^{3+}). In the case of the $CaTiO_3$:R^{3+}, Pr^{3+} exhibit red persistent luminescence while Dy^{3+} exhibits only conventional luminescence in the white region. These results will allow the design of persistent luminescence with controlled properties looking forward applications in e.g. thin films.

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