Área: MAT

Luminescent Properties of Doped Cadmium Oxyorthosilicate

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Palavras Chave: *Luminescence, Sol-Gel Synthesis, Cadmium Oxyorthosilicate*

Highlights

Luminescent property of doped cadmium oxyorthosilicate were obtained for the first time. Cd_3SiO_5 was doped with Pr^{3+}, Tb^{3+} and Eu^{3+}. A pure material was obtained with Pr and Eu, a mixture with Tb doping.

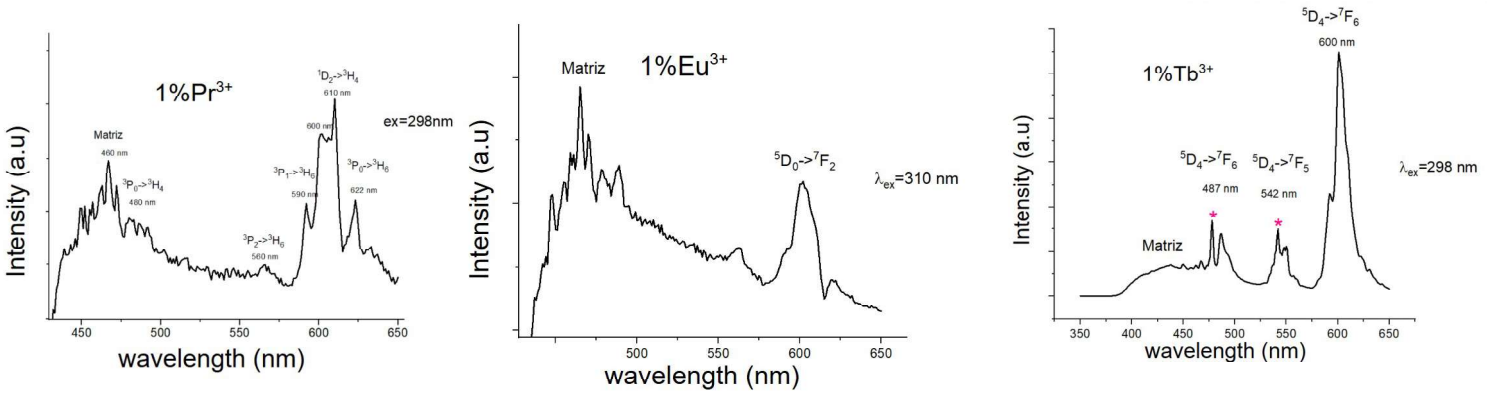
Resumo/Abstract

Cadmium silicates are materials of interest due to their stability under moisture and acidic conditions. A possibility of tailoring phosphors exists in this matrix, due to ionic radii similarities between Cd^{2+} and the most common doping agents. Specifically, Cadmium metasilicate ($CdSiO_3$) features intrinsic persistent luminescence, and these materials can be and are used in several fields, such as security lighting, light emitting diodes (LEDs) as well as bioimaging and fingerprint identification. [1]

The metasilicate, $CdSiO_3$, has been extensively studied as a phosphor, and studies have also been conducted with the orthosilicate, Cd_2SiO_4, which has a smaller band gap than $CdSiO_3$. Cadmium oxyorthosilicate, Cd_3SiO_5, however, has not received as much attention due to difficulty in obtaining it as a single, or even major phase. Recently, we reported the synthesis of Cd_3SiO_5 as a single phase by a sol-gel method. [2]

Rare earth-doped materials were prepared similarly employing cadmium acetate and tetraethylorthosilicate (TEOS) as precursors in different stoichiometric proportions. Additionally, cetyltrimethylammonium bromide (CTAB) served as a template for creating a mesoporous structure. Adjusting the pH to 3 and subjecting the material to calcination at 950°C for 6h and adding the appropriate RE3+ ion to the CTAB solution prior to hydrolysis. we achieved the formation of Cd_3SiO_5 as a single-phase, identified by X-ray diffraction, with 1% (mol) doping of Eu^3 and Pr^{3+}.A mixture with the phase -ortho Cd_2SiO_4 is observed for Tb^{3+} doping. Absorption and emission spectra were recorded using appropriate excitation wavelengths.

The Pr-doped material shows strong narrow emission lines associated with the RE ion, and a pink color (298 nm excitation) centered at 610 nm. With Eu, a broad emission line, centered at 613 nm, is observed, also pink. Doping with Tb results in a strong narrow emission line at 600 nm, characteristic of the $5D^4 \rightarrow 7F^6$ transition, with a deep red emission which contrasts to the strong green emission observed for the Tb-doped -ortho and -meta phases.



1-Jain.A. et al; *Renewable and Sustainable Energy Reviews* **65** (2016) 135-153

2-Santos.E.I.A.H.P; Vichi.F.M; J.Braz.Chem.Soc **35**,(2024) 12, e-20240124

Agradecimentos/Acknowledgments

Whe acknowlegde the Brazilian agencies CAPES, CNPq and FAPESP for the financial support. The images were made using IQ-USP Central Analítica facilities and assistance.