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Effects of different TiO₂ phases on the luminescence of CaTiO₃:Pr³⁺

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Abstract content
   (Max 300 words)

The intentervalence charge transfer mechanism is known to be the reason behind the single red emission of Pr³⁺ doped CaTiO₃ at room temperature. This comes about as a result of complete depopulation of the 3P0 level carriers by populating the 1D2 state. However, the intensity of the single red emission peak from the 1D2 ⟶ 3H4 transition is highly dependent on energy transfer from the host to the luminescent centers of Pr3+[1,2]. The final compound can have different quantities of defects such as line defects, point defects, and vacancies. These are a result of slight changes in the preparation procedures such as heating rate, cooling rate, and chemical reaction rate. Different chemical reaction rates may also be introduced by different reagent phases. All these parameters may influence the properties of the final compound, which may in turn affect energy transfer from the host to the luminescent centers of Pr³⁺ because of many non-radiative centers that may be introduced in the material [3,4]. Luminescent dynamics including phosphorescence, absorption and phosphorescence decay measurements of CaTiO₃:Pr³⁺ phosphor are reported. X-ray diffraction spectra indicated that CaTiO₃:Pr³⁺ phosphor material was successfully prepared at 1200 ^oC using the solid state reaction method. A single red emission peak from the 1D2 ⟶ 3H4 transition of Pr³⁺ was observed upon probing the materials with photons using a photoluminescence spectrometer. The cathodoluminescence stability measurements were carried out for the sample prepared with rutile and anatase TiO₂, and the sample prepared using rutile TiO₂ shows better chemical stability.

References

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Main supervisor (name and email)
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