Yttrium silicate coumpounds produced by Spark Plasma Sintering , doped with Eu^{3+} to obtain a semiconductot luminiscent material

M. A. Navarro Villanueva[1], P.A. Martínez Montoya [1], A. J. Morales Ramírez , F. Juárez López [1]

[1]Instituto Politécnico Nacional, Centro de Investigación e Innovación Tecnológica , Departamento de Metalúrgia. Cerrada de Cecati s/n, Santa Catarina, Azcapotzalco, 02250.

E-mail: merlina_ali@hotmail.com

Abstrac

Spark plasma sintering technique was used to densify both Eu-doped and Un-doped yttria silicate powders at temperatures in the range between 1300 and 1400 °C. Shrinkage behavior was investigated for sintering powders into a full-consolidated matrix for both undoped and doped Eu^{+3} yttria silicates powder. Maximum shrinkage rate at sintering temperature of 1000 °C was determined when Eu content is present. Sintering process induced phase transition from X1 to X2 in both undoped and Eu-doped powder. On yttrium silicate powders, only has been observed the typical reddish emission of Eu^{3+} ions (centered at 612 nm), however, after the SPS process, the Eu3+ has been reduced to Eu^{2+}, showing the typical bluish emission, at 404 and 445 nm, corresponding to the two different atomic positions of Eu^{2+} at the X2 phase.

Introduction

Yttria silicate ceramics are important materials due to their low thermal conductivity, low density, and good thermal shock resistance as well at high temperature as thermal insulator is one of their outstanding applications [1-4].

Fig.1 (a) powder Y_2SiO_5 (b) coumpound Y_2SiO_5

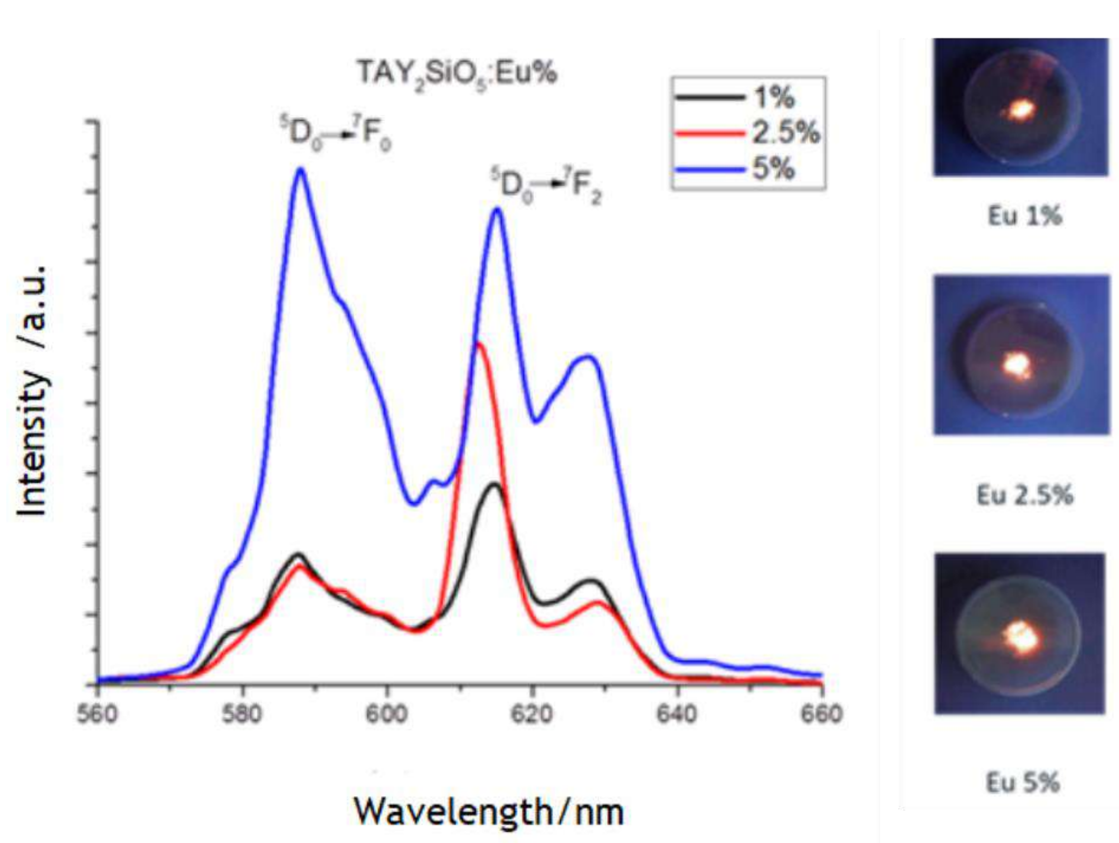


Fig 3. Emission spectrum at wavelength 612 nanometers

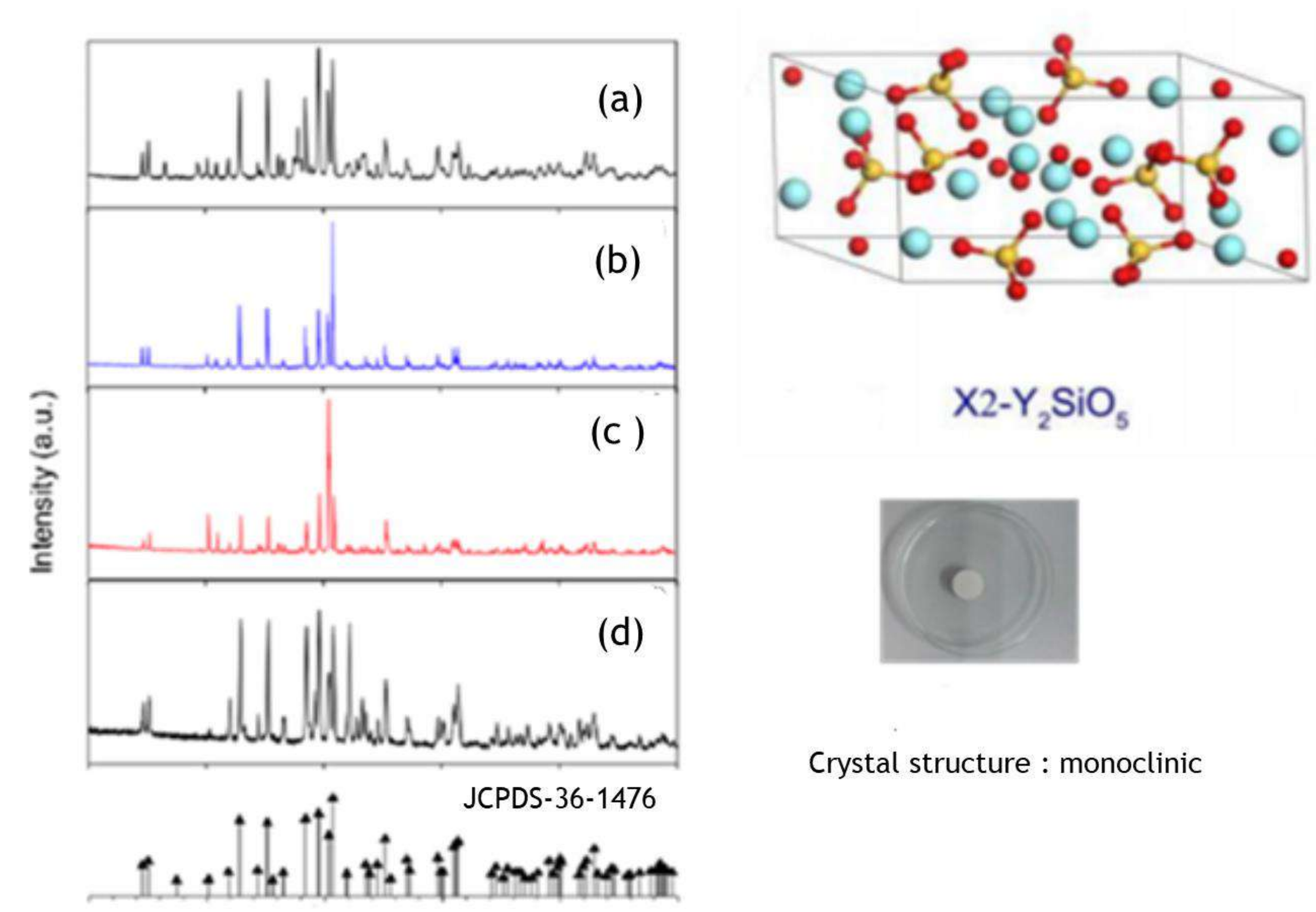
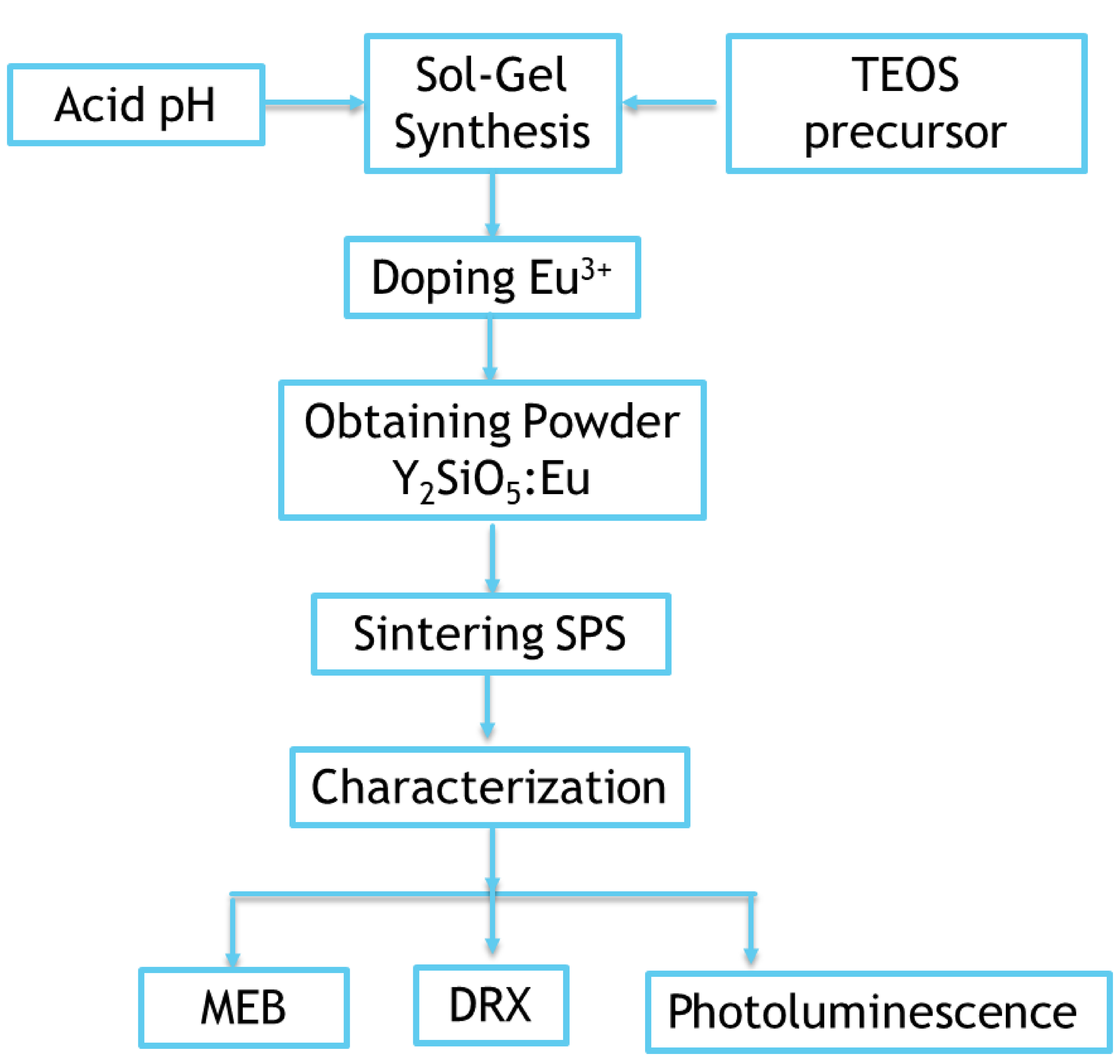


Fig. 4. XRD of undoped (a) and doped Y2SiO5 coupons with Eu+2 (b) 1, (c) 2.5 and (d) 5 % wt respectively

Metodology



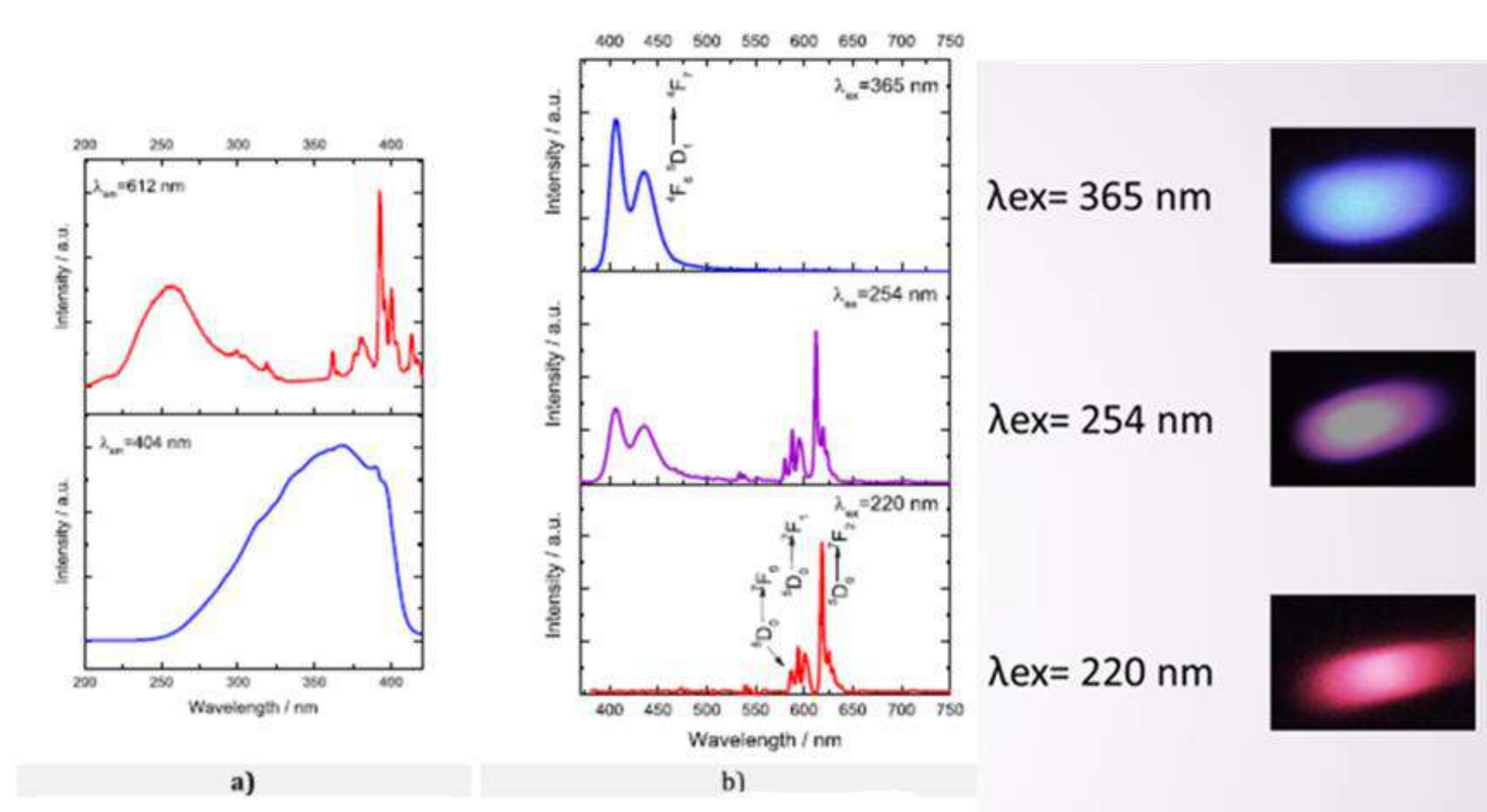


Fig 5. a) excitation spectra of coupons X2-Y_2SiO_5 doped with Eu^{3+}, b) emisión spectra of coupons doped with 2.5% Eu^{3+}

Result

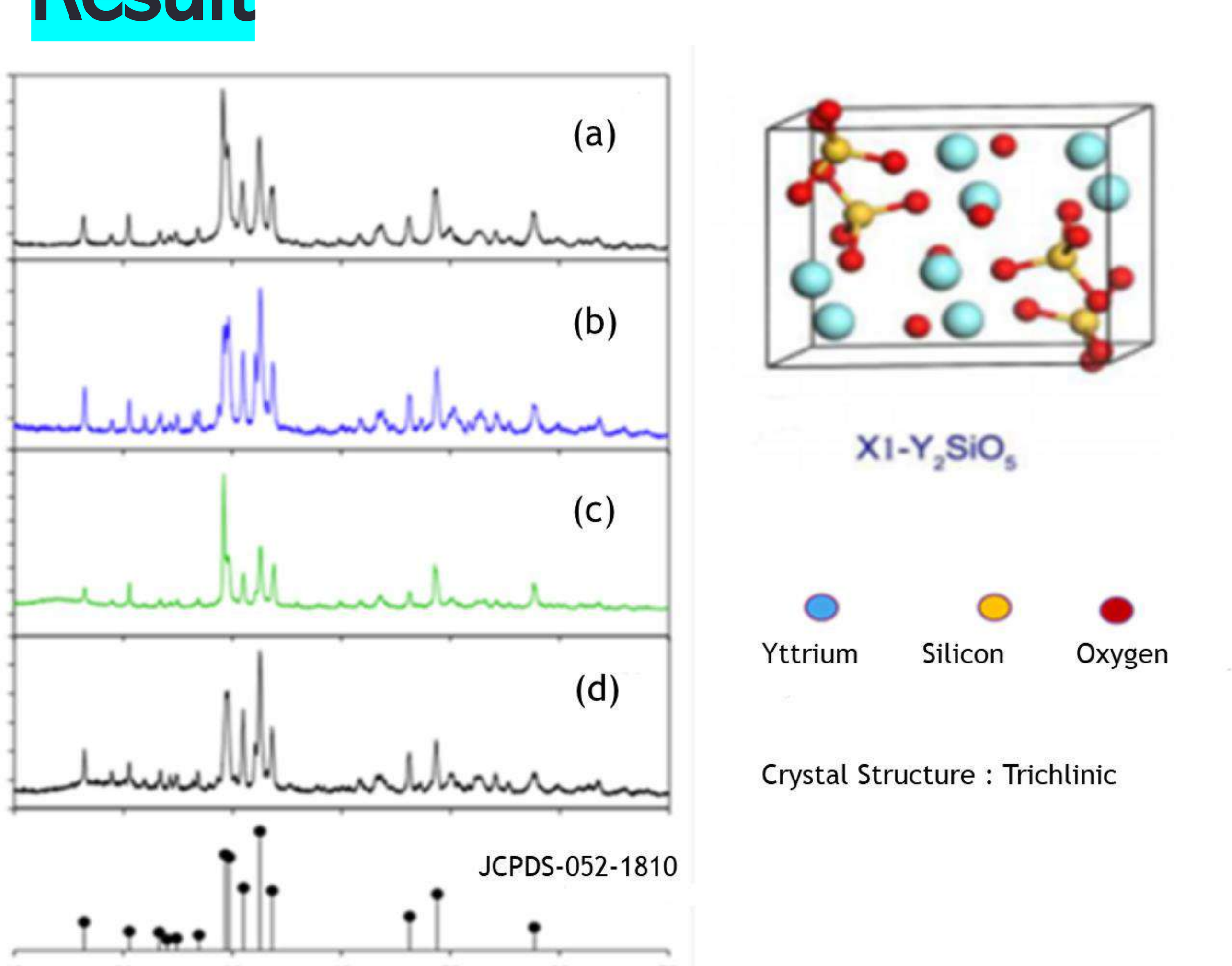


Fig. 2. XRD of undoped (a) and doped Y_2SiO_5 powder with Eu^{3+} (b) 1, (c) 2.5 and (d) 5 % wt. respectively.

Conclusions

- In the present work, Y_2SiO_5 coupons with 1, 2.5 and 5 wt % Eu^{+3} were prepared by SPS process, and their sintering consolidation behavior was studied.
- XRD, results shown that monoclinic structure was preserved after both kind specimens sintering at 1300 °C, as well as at different Eu^{+3} content, however transition of X1 to X2 phase is identified.
- It has been demonstrated the presence of Eu^{2+} after the SPS process by the blue emission of bands observed at 404 and 445 nm, which can be band observed in the coupon samples.
- Finally, the luminescent characterization shows that Eu concentration in the sintered coupons is high possible sensible for application in sense dispositive.

Reference

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