Water-dispersed bismuth-doped strontium pyrovanadate phosphor particles with sub-degree Celsius thermal resolution

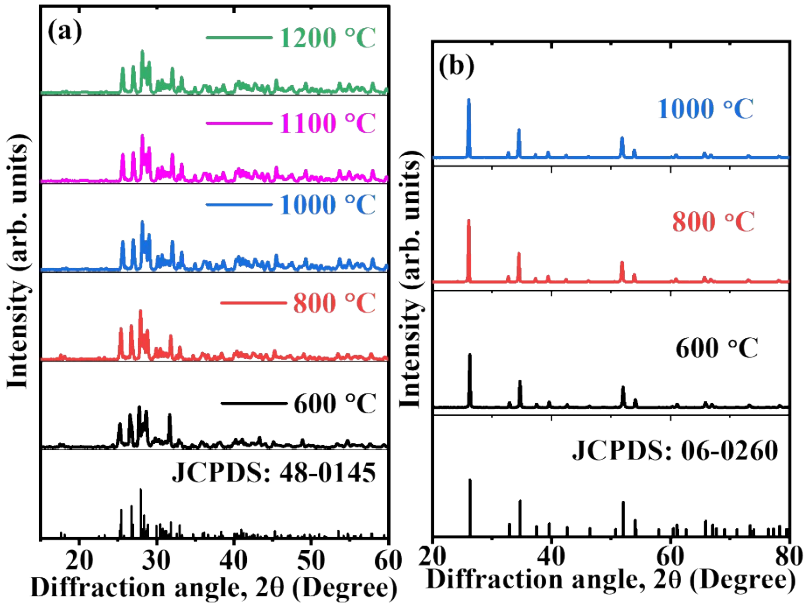
Simon N. Ogugua*, Lucas J.B. Erasmus, Robin E. Kroon, Hendrik C. Swart*

Department of Physics, University of the Free State, Bloemfontein, ZA9300, South Africa

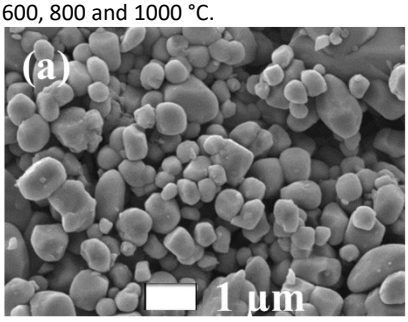
*Email: Ogugua.sn@ufs.ac.za

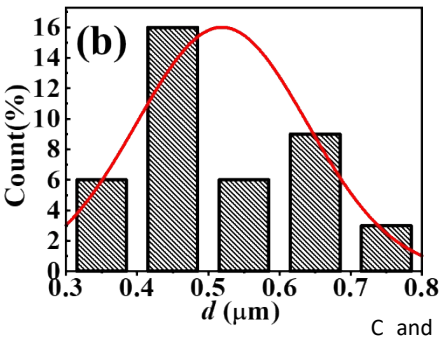
*Email: Swarthc@ufs.ac.za

The XRPD patterns of $Sr_2V_2O_7$ doped $x = 0.001Bi^{3+}$ annealed at 600, 800, 1000, 1100 and 1200 °C and $ScVO_4$:$0.01Bi^{3+}$ annealed at 600, 800 and 1000 °C are shown in S1(a) and (b), respectively. The patterns matched with the JCPDS no: 48-0145 and 06-0260 for $Sr_2V_2O_7$ and $ScVO_4$, respectively. There is no significant change in the phase of both materials with change in the annealing temperature. The $Sr_2V_2O_7$ doped with $x = 0.001Bi^{3+}$ crystallized in the triclinic phase, while $ScVO_4$:$0.01Bi^{3+}$ crystallized in the tetragonal phase.

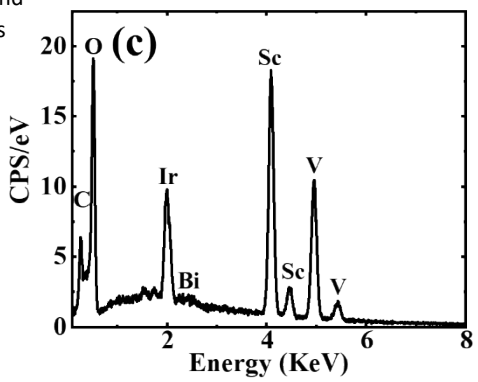


S1. The XRPD patterns of (a) $Sr_2V_2O_7$ doped $x = 0.001Bi^{3+}$ annealed at 600, 800, 1000, 1100 and 1200 °C and (b) ScVO4:$0.01Bi^{3+}$ annealed at 600, 800 and 1000 °C.



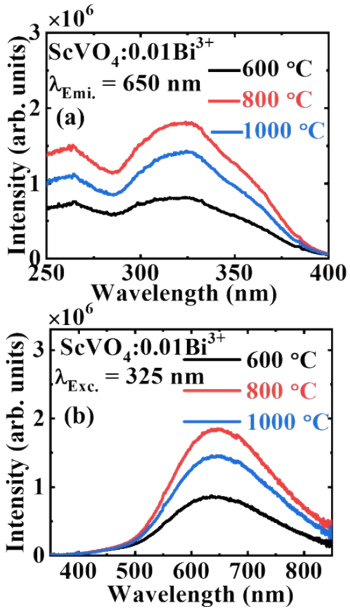


From the FE-SEM image of $ScVO_4$:$0.01Bi^{3+}$ annealed at 800 °C, the average particle size was determined to be around 0.5 µm, S2(a) and (b). The EDS spectrum of the material, S2(c), showed the presence of Sc, V, O and Bi which are expected and C and Ir. The C is from the environmental hydrocarbons and the carbon tape used for mounting the sample while the Ir was used to coat the material to avoid charging.



S2. (a) FE-SEM image, (b) particle size distribution and (c) EDS spectrum of $ScVO_4$:0.01Bi^{3+} annealed at 800 °C.

S3(a) and (b) shows the excitation and emission spectra of spectra $ScVO_4$:0.01Bi^{3+} annealed at 600, 800 and 1000 °C. The excitation was measured while monitoring the emission at 650 nm and while the emission was measured when monitoring the excitation at 325 nm.



S3. Photoluminescence (a) excitation and (b) emission spectra of $ScVO_4$:0.01Bi^{3+} annealed at 600, 800 and 1000 °C.