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Synthesis of Novel Perovskite Materials $NaNbO_3$ doped with Sulfur

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Abstract

The study herein reports the synthesis of $NaNbO_3$ powders doped with sulfur. Sulfur doped $NaNbO_3$ was synthesized by mixing precursors $NbCl_2$, $Na_2S_2O_3$ and sulfur in PTFE chamber of stainless steel hydrothermal unit and heated at 200°C for 20h. Powdered obtained after centrifugation was calcinated was at 400°C for 2h in N_2 controlled environment in a tube furnace. The morpho-structural and optical properties of the obtained materials were analyzed by X-ray diffraction (XRD), scanning electron microscopy (SEM)/electron probe microanalysis (EPMA) and ultraviolet-visible (UV-Vis) spectroscopy. Electron probe Microanalysis has confirmed 12.6% (atomic) of sulfur doping into $NaNbO_3$. Compared to pristine $NaNbO_3$; energy band gap widening and XRD peaks shifting and broadening have observed for sulfur doped $NaNbO_3$ powders. This energy band gap widening is vital and could be a novel Pb-free candidate for Perovskite Solar Cells and other applications. This study opens the doors for further investigations of sulfur doping into $NaNbO_3$ perovskite structure to optimize the doping concentration which results in optimum opto-electrical properties and open a broad spectrum of applications for this novel material.

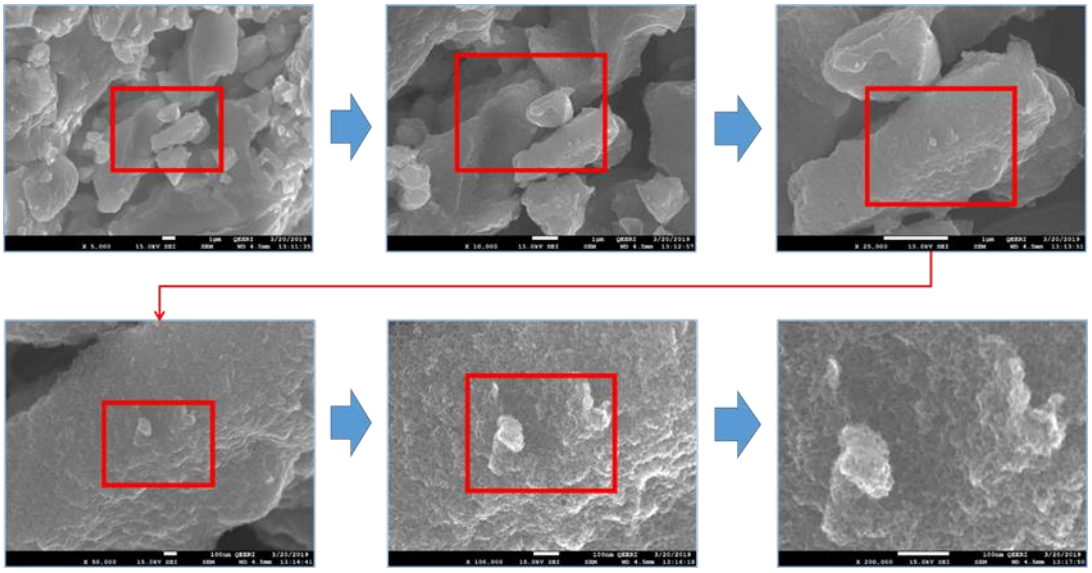
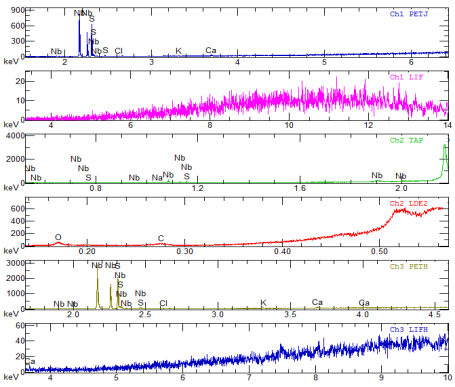


Figure 1. SEM analysis of sulfur doped $NaNbO_3$



Element	Mass(%)	Atom(%)
O	33.714	67.8954
Na	0.613	0.8595
S	12.537	12.6006
Cl	0.386	0.3502
Nb	52.751	18.2943

Figure 2. Electron Probe Microanalysis of sulfur doped $NaNbO_3$

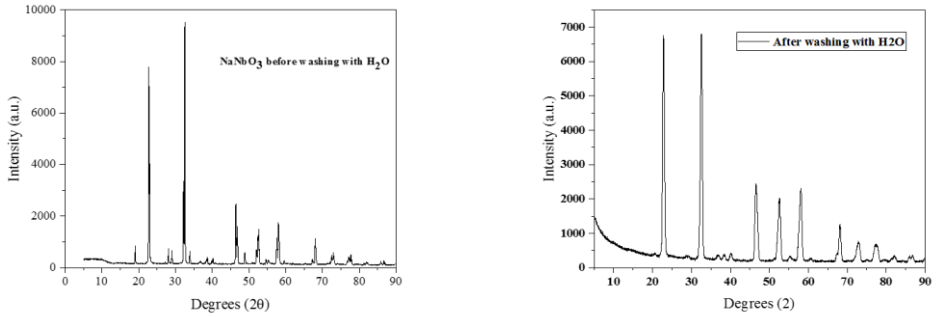


Figure 3. Sulfur Doped $NaNbO_3$ XRD patterns before and after washing with H_2O

Biography

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Dr. Adnan is Post Doc in QEERI, Qatar since 2014. He has more than 30 research articles in well reputed journals and has attended and presented in renowned International conferences like MRS, ICAE, ISES (Solar world Congress). He has 5 patents on materials synthesis and fabrication processes. Currently, he is working on Pb based and Pb-free perovskite materials synthesis for energy harvesting. He has obtained his PhD degree in Mechatronics Engineering from Jeju National University, South Korea, in Feb 2014 and Masters in Mechanical Engineering ((Applied Energy System)) from Jeju National University, South Korea, in Sept. 2010. His BS degree is in Metallurgy & Materials Sciences Engineering from GIK Institute of Engineering Sciences and Technology, Pakistan in 2007.

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