One simple and facile synthesis of different phase of vanadium di-oxide (VO_2) via hydrothermal route

Meenu Saini and **Brijnandan S Dehiya**
Deenbandhu Chhotu Ram University of Science & Technology, India

Among all these vanadium dioxide phases, VO_2 (B) and VO_2 (M) are especially interesting due to their layered structure, good energy capacity with high potential and promising applications in the field of energy conversion. VO_2 (B) is used as cathode material for Li-ion batteries, it is also used as precursor for the synthesis of VO_2 (M/R). VO_2 (M) is useful as a coating on smart windows, electrical and optical switching devices etc. In the past few decades, a lot of research work has been done in the area of synthesis of VO_2 (B) and VO_2 (M). But the synthesis of VO_2 (M) in a single step without doping is still rare. Here, we have reported the successful facile synthesis of VO_2 (B) and VO_2 (M) in one step by hydrothermal method.

Methods: The different phase of VO_2 has been synthesized by varying molar ratio of reducing agent (citric acid monohydrate, $C_6H_8O_7.H_2O$) to vanadium source (vanadium (V) oxide, V_2O_5) at an autoclave temperature of 230^oC for 24hr by hydrothermal method. Six samples were synthesized with corresponding variation in molar ratio of vanadium (V) oxide to citric acid monohydrate as 1:1, 1:1.5, 1:2, 1:3, 1:4, 1:5 respectively.

Results: The synthesized nanoparticles were characterized by XRD for phase identification and comparison done with simulation also. SEM and TEM were performed for morphology and, UV-Vis and FTIR for other physico-chemical information. Electrical conductivity studies were carried out against temperature, and thermal properties were measured using a STA. Single phase VO_2 (B), VO_2 (M) and amorphous VO_2 can be synthesized by the mere variation of reducing agent relative concentrations.

Conclusion: A simple, one-step procedure is sufficient to produce pure phases without the use of inert environment or post-synthesis heat treatments. In addition, the crystal size mode is found to be sub-10 nm

e: meenu.rschmsn@dcrustm.org

Notes: