One-step hydrothermal synthesis and thermochromic properties of chlorine-doped VO2(M) for smart window application

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Abstract	The monoclinic phase of VO2 has promising application as a smart window material because it possesses a reversible metal-tosemiconductor transformation with a critical temperature of 68 degrees C. The high critical temperature must be lowered to achieve a possible application. Anion doping has been widely researched as possible doping of VO2(M) with fluorine is the main option nowadays. However, other halogen elements such as chlorine have not been investigated albeit possessing possible advantages properties. In this work, we report the use of chlorine anion as doping for VO2(M) to lower its critical temperature and to enhance its thermochromic performance. The synthesis was performed using a facile one-step hydrothermal reduction of vanadium pentoxide by hydrazine at 350-490 degrees C, using ammonium chloride as the source of the anion. The result showed that the optimum temperature to synthesize Cl-doped VO2(M) was 490 degrees C. The lowest critical temperature that can be achieved by chlorine-doped VO2(M) was at 59.9 degrees C. The thermochromic performance of Cl-doped VO2(M) was improved compared to pristine VO2(M) nanoparticle. This finding provides a novel use of chlorine-doped VO2(M) with a facile one-step hydrothermal method to synthesize chlorine-doped VO2(M) as well as the feasibility of chlorine-doped VO2(M) as a smart window material.
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