

Nanomaterials for infrared light shielding smart window

Shu Yin

Institute of Multidisciplinary Research for Advanced Materials - Tohoku University, Japan

Synthesis of functional nanoparticles and their applications for smart window will be introduced. Various kinds of nanomaterials and their composites were successfully synthesized by solvothermal process. Thin films on glass substrate were fabricated by doctor blade method using nanoparticles as starting materials. The mixed valence state tungsten based homogeneous nanomaterials M_xWO_3 and $W_{18}O_{49}$ possessed excellent IR light shielding properties. In summer days, the mixed valence state tungsten based IR-shielding smart coating can block harmful UV light and most of the NIR lights with heat effect and keep cooler indoors, also transmit visible light. While, in winter days, the turnaround smart coating reduces heat loss from indoors, transmit visible light effectively. It is obvious that these materials have potential applications for the heat ray

shielding and indoor energy saving effect. On the other hand, VO_2 monoclinic based nanoparticles possessed excellent and smart thermochromic property, possessed heat ray shielding effect in summer and heating effect of indoors in winter. The VO_2 based materials show higher energy saving effect than those of normal IR shielding materials. Also, multifunctionality of thin films was successfully realized by fabricating the composites with various functional components. Not only UV/IR shielding property, but also environment purification and self-cleaning functions can be expected, indicating their great potential as novel housing materials. The design of composites and thin films structure might result in property improvement of particle applications for smart windows.

shuyin@tagen.tohoku.ac.jp