

論文内容要旨

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学位論文題目	Optoelectrical and Photochemical Investigation of 2D Nanomaterials and their Nanocomposites Fabricated by Laser Ablation in Liquid (液中レーザーアブレーション法で作製した2Dナノ材料とその複合材料の光電気的および光化学的特性の研究)		
<p>内容要旨</p> <p>Synthesis of In_2Se_3 nanocubes fabricated by laser ablation under DI water and its field electron emission properties as well as the carrier dynamics were investigated successfully for the application of high current density cold cathode material. The morphological characterization carried out using field-emission scanning electron microscopy (FESEM) and transmission electron microscopy (TEM) reveal that the nano-cubes have an average size of 70 nm. The X-ray diffraction and Raman analysis clearly imply the formation of pure and crystalline In_2Se_3 phase only, without any impurity phases, despite the laser ablation being carried out in aqueous medium. A superior field emission property characterized by lower values of turn-on and threshold fields as compared to In_2Se_3 nanowires emitter and ability to deliver very large current density $\sim 2656 \mu\text{A}/\text{cm}^2$ by applying the field of $9.7 \text{ V}/\mu\text{m}$. Transient absorption spectra reveal there are no deep trap levels, and the electrons in nanocubes can be regarded as mobile carriers through the hopping process and travel long distance in the absence of holes.</p> <p>Carrier dynamics and photocatalytic performance of novel $\text{In}_2\text{Se}_3/\text{ZnO}/\text{Au}$-nanoparticle ternary composite system is investigated. The ternary photocatalytic system was fabricated using hydrothermal and laser ablation technique. The structural and physical characteristics have been studied by SEM, TEM, ultraviolet-visible (UV-Vis) spectrophotometry, and micro-Raman spectroscopy. The photocatalytic activity of the nanocomposites was estimated through the photocatalytic degradation utilizing organic dye of methylene blue in an aqueous solution. Results suggested that the ternary composite showed better photocatalytic performance compared with the pristine and binary composites.</p> <p>Production of few layers graphene from graphite is fabricated by UV laser scanning method. Morphological, structural, and optical properties were investigated by TEM, HRTEM, UV-Vis spectroscopy, and Micro-Raman spectroscopy. The surface modification of graphite under different liquid environments was investigated by optical laser microscope. After laser scanning the holes in graphite surface becomes dipper and less wide. The laser scanning process is most effective process to remove the layers of the graphite plate. Dips and hill are modified after laser scanning.</p>			