A Novel Heteronanostructure System : Hierarchical W nanothorn Arrays On WO_3 nanowhiskers

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We show that the hierarchical W nanothorn-WO3 nanowhisker(WWO) produced by the simple thermal evaporation process possess a well-developed hierarchical nanothorn-nanostem structure. Primary WWOs are organized in heterojunction that are 20~60nm in diameter of the nanothorn, 200~500nm in diameter of the nanostem. The hierarchical system constitutes the nanostem, and the high density nanothorn, which covered with a amorphous layer. The noble structures are well aligned along the nanostem axis and densely packed. The hierarchical WWO shows promising field emission performance with a reasonably excellent field emission results. The turn-on field and enhancement factor are comparable to those of many other nanomaterials. Schematic illustration with chemical transport and condensation of the new reactant agree with the proposed thorn-stem model and can be used for hetero structure characterization. The well-developed high density and surface area in hierarchical system with controllable electrical and mechanical functionalities make the WWO attractive materials for nanotechnologies, where thermal and nucleation properties play an important role.