

Synthesis of donuts-like SnO₂ structures composed of small SnO₂ nanocrystals on silicon substrate: Growth mechanism, structural and optical properties

*Ahmad Umar**
Najran University, Saudi Arabia,

Abstract:

Donuts-shaped crystalline SnO₂ structures composed of small SnO₂ nanocrystals were grown on silicon substrate, for the first time, via non-catalytic simple thermal evaporation process by using tin powder in the presence of oxygen. The as-grown donuts-like SnO₂ structures were characterized in detail in terms of their structural and optical properties by using X-ray diffraction (XRD), field emission scanning electron microscopy (FESEM), Energy-dispersive spectroscopy (EDS) and room-temperature photoluminescence (PL). The morphological observations by FESEM revealed that the grown structures are donuts-like which are made by the random accumulation of hundreds of small SnO₂ nanocrystals. The optical property of as-grown donut-shape structures was observed by room-temperature PL spectrum which exhibit three bands, i.e. UV emission at ~355 nm, blue emission at ~464 nm and a green emission at ~520 nm. A plausible growth mechanism has also been proposed for the formation of donut-shaped SnO₂ structures.

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