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A Gas Sensing Material Synthesis Method based on Controlled Crystal Growth

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Nanotechnology and New Materials

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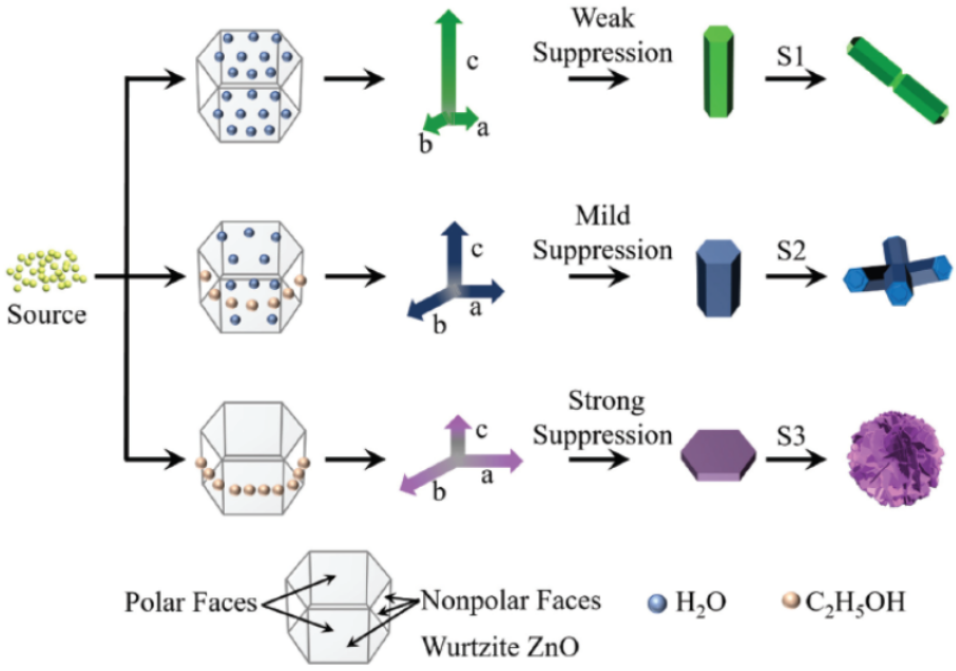

Schematic of the formation mechanisms of ZnO crystals across different suppression of c-axis growth

IP Status
Patent granted

Technology Readiness Level (TRL) ? 3

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Opportunity

There is a great demand in the commercial market of advanced environmental sensors that can detect toxic airborne contaminants ubiquitously and economically. Today, thin film nanostructures of transition metal oxide (TMO), such as Nickel(II) oxide (NiO) or Tungsten trioxide (WO3), is the most prominent material for commercial gas sensors, owing to high sensitivity, ease of fabrication and chemical stability. The study of fabrication methods for ordered TMO nanostructures, such as hard- and soft- templating methods and template-free methods, has been conducted extensively. Template-based methods tend to suffer from complex and multi-processing steps as well as lack of uniformity, whereas template-free method can significantly simplify the fabrication process. However, existing template-free or solution-based methods for TMO nanostructures are still tedious and unreliable.

Technology

The present technology relates to a template-free synthesis method that can achieve controllable TMO nanostructured morphologies. The said method is based on the promotion and suppression of growth at specific crystallographic dimension by tuning the polarity of the solvent. The result shows that enhancing the c-axis growth while supressing the growth in other crystallographic dimension is an effective approach for achieving desirable gas sensing properties. One of the embodiments in the technology is studied based on an ammonia gas sensor fabricated and characterized the nanostructured morphology of Zinc oxide (ZnO) as the sensing material.

Advantages

- Control the nanostructured morphologies of TMO for desirable gas sensing properties
- Improve sensitivity and response-time of the gas sensor
- Improved resilience to long term drift

Applications

- Gas sensors for detecting toxic airborne contaminants based on TMO as the sensing material