Development of Dislocation Constraint Technique for SiC Sublimation Growth

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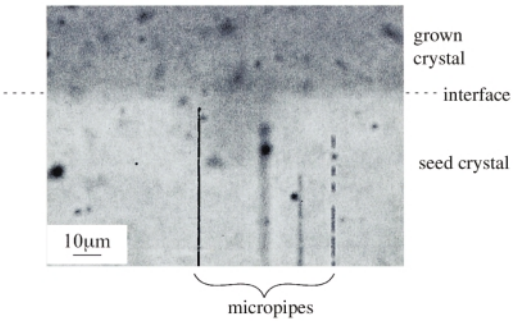
Dislocation constraint in the growth of SiC crystal by the sublimation method (modified Lely method) was studied. In SiC single crystal growth, the dislocations and defects generally propagate from the seed crystal surface. However, when the etch back on the seed crystal surface in the sublimation process was performed prior to growth, defects and dislocations propagation in the interface between the seed crystal and the grown crystal were suppressed reasonably. The switchover from the etch back to the growth could be performed without changing heating condition during the initial process. We noticed that the density of the hollow defects called as micropipes in the grown crystal were decreased to 1/10 compared to that of the seed crystal used. We consider the etch back process of the seed crystal is an effective method for constraining the defects in the SiC crystal growth.



Optical micrograph showing several micropipes in the interface region between the seed crystal and the grown crystal. Some micropipes terminated just below the boundary are seen.

Hydrogen Gas Sensors for Fuel Cell-powered Vehicles

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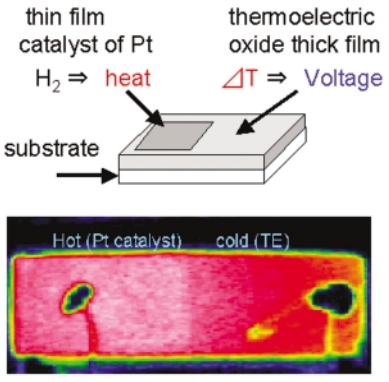
A novel hydrogen gas sensor, consisting of a film of thermoelectric material coated with platinum catalyst on half of its top surface, has been developed. When this sensor was exposed to air mixed with hydrogen gas, the catalytic reaction resulted in temperature increment of the Pt-coated surface, and then thermoelectric voltage appeared across the hot and cold region of the oxide film. At room temperature, the platinum catalyst reacts only with hydrogen gas, so the sensor has high selectivity to hydrogen gas. Moreover, the sensor is energy efficient, as it operates at room temperature, and is suitable for integration into silicon substrates.



Schematic of the thermoelectric hydrogen sensor. Lower image is the temperature distribution of the sensor device surface monitored by the infrared-camera.