

Tensile Testing of Single-Crystal Silicon Thin Films at 600°C Using Infrared Radiation Heating

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In this paper, we report the development of a new tensile tester operable at 800°C using an infrared radiation heating method to evaluate the mechanical properties of thin films at high temperature. The tester uses an electrostatic grip system for specimen chucking. We evaluated the grip force at high temperature and concluded that the electrostatic grip is effective up to 800°C. Single-crystal silicon specimens of 3 μm thickness and 4 μm width were tested at room temperature (RT) and 600°C. At RT, the fracture strength and Young's modulus were 3.33 and 163.2 GPa, respectively. At 600°C, they were 2.71 and 151.8 GPa, respectively. The stress and stage displacement curves at 600°C with lower strain rate showed yield points and the fractured specimens exhibited slip lines.

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