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Materials: Tougher chips on the menu

A new technique to develop electronics for extreme environments and high-power applications is reported in *Nature* on 26 August. Silicon carbide (SiC) has the potential to replace silicon as the material used for a range of devices, but until now has proved tricky to produce without defects that interfere with its reliability.

Kazumasa Takatori and colleagues solve this problem by growing the crystals in several different stages. At each stage, further growth is only allowed on the cleanest face of the crystal — this gradually eliminates any defects from its structure.

This new research has implications for the development of a wide range of improved devices, ranging from electronics that work in red-hot jet engines and which could lead to lighter spacecraft, to significantly improved wireless communications and radar, and could even improve the smart devices that optimize performance in your car. Erik Janzén, of the Department of Physics at Linkoping University and an expert in the field, will discuss the new methods revealed in the *Nature* paper at a press briefing at the European Open Science Forum 2004 in Stockholm.

Notes to editors:

The authors of the paper have provided a helpful Q&A which follows:

1. Why is silicon carbide better than silicon for producing electronic chips?

Silicon carbide (SiC) has, by nature, wider band-gap than silicon (Si). This is one of the reasons why SiC has excellent properties. SiC has more excellent physical and electronic property than conventional semiconductor such as Si. For example, the electric breakdown field of SiC is one order higher that of Si, and the value of thermal conductivity is about three times as large as that of Si. Therefore, high power electronic devices based on SiC have lower electrical resistance, and have higher tolerance against heat generation than Si devices. We believe SiC is one of the most excellent materials for high-power electronic devices.

2. Where could it be used that silicon cannot?
Si devices cover the wide-range of applications from micro-chips to high-power electric converters. SiC could replace the high-power applications. In addition, SiC could be applied to devices for high-temperature and for radiation-proof.

3. What led you to this new method for growing crystals?
Detailed investigations of defect structures in SiC grown along various crystallographic axes inspired the idea.

4. What is the next stage of your research?
To eliminate the dislocations perfectly, to enlarge the size of crystals such as silicon crystal, to cut the cost, leading to the application
for the high performance SiC devices.

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