3.10.8 SiC, Another Diamond Synthesis

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Silicon carbide (SiC) is a key material in the attempt to cut CO_2 emission. When we replace Si with SiC as the material used in high-power inverter devices, the cut-off will be equivalent with two nuclear power plants in Japan. Although this material has been expected since 1950's, the bottle neck of the replacement of Si with SiC is the high costs of its wafer production.

The authors have very recently reported a simple method that enables the epitaxial growth of SiC from the liquid phase at relatively low temperatures with a reasonably high growth rate [1]. The driving force of the new process is the metastability of 3C-SiC, which is explained by the double-phase diagram of the $Si-C$ system. The double-phase diagram is commonly used in metallurgy to illustrate the $Fe-C$ system and systems including metastable phases.

The origin of the driving force of new process is the same as those of the long-known phenomenon of Ostwald ripening, and the production of synthetic diamonds developed by General Electric. In this presentation, we will also show the experimental results of SiC growth, and the first principles calculations of the phase stabilities of polytypes of SiC.

1. Shigeto R. Nishitani and Tadaaki Kaneko, J. Crystal Growth, 210 (2008), 1815-1818.