

佐藤公則

高エネルギー加速器研究機構物質構造科学研究所

(受入教官：桂智男)

Pressure and temperature conditions for spontaneous nucleation of diamond in the system of  $(\text{Ca}_{0.4}\text{Mg}_{0.6})\text{CO}_3$ -graphite-molybdenum up to 10 GPa and 1800°C.

*Abstract:* High-pressure experiments were performed to determine the pressure and temperature conditions for spontaneous nucleation of diamond in the system of  $(\text{Ca}_{0.4}\text{Mg}_{0.6})\text{CO}_3$ -graphite-molybdenum up to 10 GPa and 1800°C with a multi-anvil type high-pressure apparatus. Diamond crystallization by spontaneous nucleation was observed under conditions above 1600°C and 8 GPa. The clearly defined P-T region indicates that there is threshold of pressure and temperature for diamond spontaneous nucleation. The lower limit temperatures required for diamond nucleation was bounded by the solidus, indicating that molten state is necessary for diamond formation. Compared with those in the system of  $(\text{Ca}_{0.4}\text{Mg}_{0.6})\text{CO}_3$ -graphite without Mo at about 8 GPa, the minimum temperature required for spontaneous nucleation of diamond can be reduced for at least 200°C down to 1600°C by the addition of Mo to the carbonate-graphite system. These results shows drastic effect of additional Mo on the expansion of temperature conditions required for diamond nucleation.

The crystallization at lower temperatures in the system with Mo than those in the system without Mo indicates that different mechanism should be operated upon nucleation process, and it could be pointed out that expelled carbon from which a reaction between the carbonate and Mo might play an important role in the nucleation process.

(submitted to Diamond and Related Materials)