small asteroid impact in the Southern Ocean [11]. Two modes of formation, both impact related, have been proposed for these magnesioferrite-bearing spherules. The consistently high Fe^{3+}/Fe^{2+} ratio of the spinels indicates formation under high O fugacity conditions [9,10]. Robin [10,12] supports an origin by chondritic meteoroid ablation in the atmosphere and argues that the variation in spinel composition between sites is due to multiple accretionary events. Kyte [9] proposes that the magnesioferrite-bearing spherules formed by fractionation processes related to vaporization and condensation out of the fireball following an impact event. The recent discovery of Ni-rich magnesiowüstite inside the magnesioferrite phases supports the high-temperature vapor cloud origin [13,14], as magnesiowüstite can only crystallize from an ultrarefractory MgO-rich liquid. Unfortunately, the magnesiowüstite is only documented in two of the K/T Pacific sites because their relatively small size (a few micrometers) renders the search for such phases difficult under SEM and restricts the chemical analyses of the phases with the microprobe.

We have prepared a series of magnesioferrite-bearing spherules from the K/T boundary in Furlo (Italy) and from the Late Pliocene for study under TEM. The TEM higher-resolution and microanalytical capabilities can better document the magnesiowüstite inclusions and identify lattice defects, which can provide important clues to their formation mechanism and conditions, and perhaps reveal other high-temperature mineral phases. This information is important to better understand the conditions within the vapor cloud formed after a impact event.

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MICROSTRUCTURAL CHARACTERISTICS OF IMPACT DIAMONDS FROM THE POPIGAI CRATER, RUSSIA. F. Langenhorst[1] and V. L. Masaitis[2], [1]Institut für Mineralogie, Museum für Naturkunde, Humboldt-Universität zu Berlin, Invalidenstrasse 43, 10115 Berlin, Germany, [2]Karpinsky Geological Research Institute, Sredny prospekt 74, 199026 St. Petersburg, Russia.

Introduction: Impact diamonds have been first synthesized in high-explosive shock experiments, and are also known to occur in ureilites, the iron meteorite Canyon Diablo, and heavily shocked terrestrial impactites [1–5]. Terrestrial impact diamonds have been first discovered at the Popigai Crater, Russia [3], and subsequently at many other impact craters of the former U.S.S.R., the Ries Crater [4], and numerous Cretaceous/Tertiary sites [5]. At Popigai, two basic types of diamonds have been described: idiomorphic diamond platelets, so-called paramorphs, and xenomorphic, polycrystalline aggregates. Diamond paramorphs are mainly found as inclusions in strongly shocked (>30 GPa) gneiss clasts of suevites, whereas the polycrystalline aggregates occur in impact melt rocks (tagamites) and impact melt clasts of suevites. The goal of the present study was to elucidate the microstructural characteristics of both diamond types by transmission electron microscopy (TEM), which could provide important clues to their formation.

Results: Due to their special morphology and size (≤1 mm), the diamond platelets could be successfully thinned by Ar ion beam bombardment. The original dark grains became transparent after thinning and showed anomalous birefringence. TEM revealed a layered internal structure. Individual layers vary in thickness from 100 to 500 nm. Electron diffraction patterns are consistent with diamond and show streakiness due to the layered structure.

Diamond aggregates have been crushed and then mounted on holey carbon grids. The aggregates are composed of irregularly shaped, sometimes elongated microcrystals with grain sizes <1 µm. These microcrystals contain numerous stacking faults parallel to (110). Electron diffraction patterns are in agreement with diamond and show additionally satellite spots, which are probably caused by the stacking faults.

Conclusions: The morphological characteristics of diamond paramorphs and their presence in shocked gneisses indicate a martensitic, solid-state transformation from graphite to diamond. The layered microstructure of these diamonds might represent a remnant of the former graphite structure. In contrast, the diamond aggregates apparently have formed by condensation from impact vapor, as has been recently suggested by [4]. In similarity to the diamond aggregates from Popigai, stacking faults are also the major defects in diamond films synthesized by chemical vapor deposition (CVD) experiments.

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A NEW LOOK AT Be AND B CONDENSATION. D. S. Lauretta and K. Lodders, Planetary Chemistry Laboratory, Department of Earth and Planetary Sciences, Washington University, St. Louis MO 63130-4899, USA.

The meteoritic abundances of Be and B are often used to constrain models of light-element formation [1]. The condensation of Be and B in the solar nebula was reinvestigated to identify the host phases for these trace elements in meteorites. The condensation behavior of Be is shown in Fig. 1. At high temperatures the dominant Be species is monatomic Be, while BeOH and $Be(OH)_2$ dominate at lower temperatures. Initially, Be condenses as gugiaite ($Ca_2BeSi_2O_7$), which is isostructural with akermanite, in solid solution with melilite. If melilite is the only host phase, the 50% condensation temperature for Be is 1490 K (dashed curve). The other potential host phase for Be is chrysoberyl ($BeAl_2O_4$) in solid solution with spinel ($MgAl_2O_4$), which forms after melilite starts condensing. Assuming ideal chrysoberyl-spinel solid solution, 50% of Be is condensed into melilite and spinel at 1507 K (solid curves). Ideality was assumed by [2], who predicted condensation of all Be into spinel. However, chrysoberyl and spinel have very different crys-

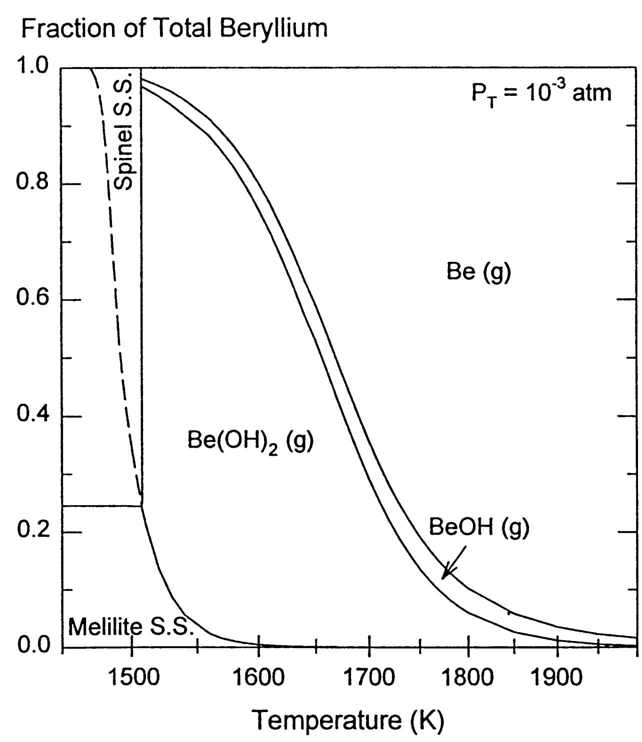

Fig. 1.