A TEM STUDY OF GRV 024516, A UUREILITE FROM GROVE MOUNTAINS: EVIDENCE FOR SHOCK-INDUCED ORIGIN OF DIAMOND. B. Miao[1], Y. Lin[2], B. Wang[1] and D. Wang[3]. [1]Key Laboratory of Geological Engineering Center of Guangxi Province, Guilin University of Technology, Guilin 541004, China. Email: miaobk@glite.edu.cn. [2]Key Laboratory of the Earth's Deep Interior, Institute of Geology and Geophysics, CAS, Beijing. [3]Guangzhou Institute of Geochemistry, CAS.

Introduction: Ureilites are primitive achondrites and contain high abundance of carbon [1]. Graphite is the most common polymorph of carbon. Diamond and lonsdaleite have also been identified by electron diffraction. Various models were proposed to explain formation of diamond, e.g. nebular condensation, chemical vapor deposition, and shock transformation [2]. In order to understand the process of transformation of graphite to diamond by shock, we conducted Raman and TEM observations on a new ureilite (GRV 024516) found in Grove Mountains, Antarctica.

Results: GRV 024516 is a monomict ureilite with a S2/3 shock grade. It contains 6.5 vol% carbonaceous materials, with occurrences of (a) irregular patches and veins among coarse-grained silicates, (b) euhedral plates inside pigeonite graines, (c) irregular patches inside olivine grains. All carbonaceous grains are black under reflect light, indicating that they are shocked and compressed. According to Laser microRaman spectrium, the carbonaceous materials consist of diamond (with the peak of 1331 cm^{-1}) and intergrowth of graphite (with the peak of 1583 cm^{-1}) and lonsdaleite (with the peak of 1320 cm^{-1}). TEM investigation shows that graphite is polycrystalline, consisting of bright graphite layers and dark lonsdaleite blocks (Fig. 1).

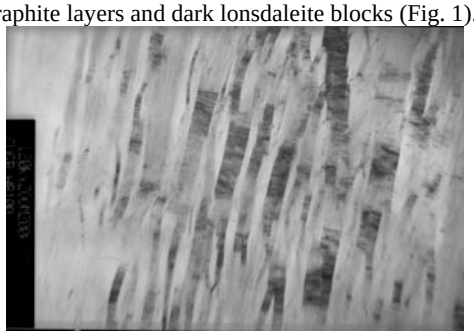

Figure 1 TEM micrograph of graphite, the dark blocks are lonsdaleite, width is 750 nm.

Discussion: The occurrece of euhedral graphite plates embedded in pigeonite suggests crystallization of graphite from a primary magma. The occurrence of diamond and lonsdaleite in graphite confirms a shock-induced origin of diamond. The relation between lonsdaleite and graphite reveals that lonsdaleite should have been transformed directly from graphite by shock, and the former was possibly further transformed to diamond. However, more evidence for the relationship between diamond and lonsdaleite are required.

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