

Structural change in molten basalt at deep mantle P-T conditions

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In the recent years, structural and density information on silica glass have been obtained up to record pressures of up to 100 GPa¹, a first major step towards obtaining data on the molten state.

In this abstract, the structure of molten basalt is reported up to 60 GPa by means of in situ x-ray diffraction, and structural changes are evidenced. Silicon coordination increases from 4 at ambient conditions to 6 at 35 GPa, similarly to what has been reported in silica glass¹⁻³. Compressibility of the melt after completion of Si coordination change is lower than at lower pressure (P) conditions, implying that a single equation of state can not accurately describe density evolution of silicate melts over the whole mantle P-range. The transition pressure coincides with a marked change in the P-evolution of nickel partitioning between molten iron and molten silicates, indicating that melt compressibility controls siderophile element partitioning.

1. Sato and Funamori, PRL 101, 255502 (2008). 2. Meade *et al.* PRL 69, 1387 (1992). 3. Benmore *et al.*, PRB 81, 054105 (2010).

Ion microprobe U-Pb dating and Sr isotope measurement of a proto-conodont

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We report here *in situ* ion microprobe U-Pb dating of a protoconodont micro-fossil using a NanoSIMS [1,2]. Twenty-three spots on the single fragment of the protoconodont (size: approximately 850 μm x 250 μm) derived from a sedimentary layer in the Meishucunian formation, Yunnan Province, South China provide a ²³⁸U/²⁰⁶Pb isochron age of 547 \pm 43 Ma (2 σ , MSWD=1.9), which is consistent with the depositional age of the formation, 536.5 \pm 2.5 Ma reported by a zircon U-Pb dating [3]. On the other hand, five spots on the small region in the sample yield the isochron age of 416 \pm 73 Ma (2 σ , MSWD=0.31), apparently younger than the formation age. The younger age may be attributable to the latter metamorphic event, probably Caledonian orogenic activity recorded in the younger zircon with the age of 420 - 440 Ma [4].

We also measured the ⁸⁷Sr/⁸⁶Sr ratios of the protoconodont by a NanoSIMS [5]. Nineteen spots on the older age region give the ⁸⁷Sr/⁸⁶Sr ratio of 0.71032 \pm 0.00023 (2 σ) on the weighted mean average, while seven spots on the younger area provide that of 0.70862 \pm 0.00045 (2 σ), significantly smaller than the older part. This is the first finding of U-Pb age and Sr isotope heterogeneity within a single fragment of micro-fossil, even though there is not a large chemical difference measured by a semi-quantitative SEM-EDS analysis.

[1] Sano *et al.* (2006) *Geochem. J.* **40**, 597-608. [2] Takahata *et al.* (2008) *Gond. Res.* **14**, 587-596. [3] Sawaki *et al.* (2008) *Gond. Res.* **14**, 148-158. [4] Guo *et al.* (2009) *Geochem. J.* **43**, 101-122. [5] Sano *et al.* (2008) *App. Geochem.* **23**, 2406-2413.