**Bulk rock measurements**

Major elements on whole rock powders from samples from the SHAARC cruise were analysed by X-ray fluorescence using the Spectro XEPOS instrument at the GeoZentrum Nordbayern (GZN; FAU Erlangen-Nürnberg) and following the techniques described in Haase et al. 2016.

Trace element analyses of whole rock powder were performed in the clean lab facilities of the GZN following standard digestion procedures with HNO3-HF-HCl as reagents and the Thermo Scientific® X-Series 2 quadrupole ICPMS system at the GZN. Details of the method can be found in Romer et al. 2018. Procedural blanks analysed during this work were negligible for all elements measured.

Trace element analyses of a subset of SO94, SO133 and SHAARC samples were performed via nanoparticulate pressed powder tablets and laser-ablation inductively-coupled plasma mass spectrometry (LA-ICPMS) at the Institute of Geosciences of the CAU Kiel. Here, a GeoLas HD 193 nm excimer laser ablation system is coupled on-line to an Agilent 7900 quadrupole ICPMS. The samples were run along with samples from Brothers and the reader is referred to Brandl et al. 2023 for details on the method (including sample preparation), data processing and results for reference materials.

**Major element analyses of minerals and melt inclusions**

Electron probe micro analyses (EPMA) were performed at the JEOL JXA-8200 electron microprobe at GEOMAR in Kiel in wavelength dispersive (WD) mode. The instrument was operated with 15 kV acceleration voltage and a focused beam (approximately 1 µm diameter) for plagioclase, clinopyroxene, sulfides and spinel, and a defocused beam of 3 µm for mica and amphibole and of 5 µm for melt inclusions. The beam current was set at 10 nA for amphibole and mica, at 20 nA for plagioclase as well as clinopyroxene, at 50 nA for sulfide and spinel and at 10 nA for melt inclusions.

**Trace element analyses of minerals and melt inclusions**

Trace elements and selected main components in sulfides, melt inclusions and clinopyroxenes were analysed by LA-ICP-MS at the GEOMAR Helmholtz Centre for Ocean Research Kiel (Germany). We used a 193 nm Excimer laser ablation system (Coherent, GeoLasPro) coupled to a double-focusing, high-resolution magnetic sector mass spectrometer (Nu Instruments, AttoM) under hot plasma conditions (NAI = 30 - 40; ThO/Th = 0.010 – 0.018 %; details in Fietzke and Frische 2016). Spot analyses were done using 30 s of ablation under Helium carrier gas at a laser repetition rate of 5 Hz, using spot diameters between 16 and 44 µm. The energy density was 2 J cm-2 for ablating sulfides and 5 J cm-2 for ablating clinopyroxenes and melt inclusions. The USGS glass standard BHVO-2G (Wolf and Wilson 2007), the MPI-DING glass KL2-G (Jochum et al. 2006), the USGS sulfide standard MASS-1 (Wilson et al. 2002), and the synthetic sulfide laboratory standards PGE\_Ni7B and trans1 (Wohlgemuth-Ueberwasser et al. 2007) were used as reference materials. NIST-SRM610 (Wise and Watters 2012) was used for mass calibration. 50 s of gas background data were collected prior to each ablation. For internal standardization, 29Si was used for silicates and 65Cu for sulfides, utilizing data from EMP analysis as reference values. Data evaluation was performed by applying the linear regression slope method proposed by Fietzke et al. 2008.

**Melt inclusions filtering**

Several melt inclusions measurements were filtered out from the data as they exhibited unusual chemical compositions indicating a significant melt-mineral mixture. In detail, measurements with a CaO content above 8 wt. % were filtered out as they were indicating clinopyroxene contamination. Similarly melt-apatite mixtures were identified through P2O5 content above 20 wt.% and removed. Feldspar contaminated measurements were partly identified through Al2O3 above 23 wt. % and filtered out. The measurements with MgO below 1.5 wt. % displayed a broad compositional range, which couldn’t be attributed completely to melt composition and where mineral contamination was obvious. However, due to the difficulty of establishing a clear distinction between normal melt inclusions and melt-mineral mixtures, the measurements of MgO below 1.5 wt. % were all removed.

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