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TI: Extreme Iron Enrichment in Graphite-Saturated Melts of Kiglapait Upper Zone Rocks at 5 kb
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AB: The extent of total iron enrichment in extreme Fenner-trend magmatic differentiation has been a source of controversy, notably in the context of the Skaergaard intrusion (Hunter \& Sparks CMP 95, '87), where the summed UZ rocks are unusually mafic (SiO2 $^\sim$45\%) and rich in FeTi oxides. In the course of trying to extend the Kiglapait liquid line of descent (KI-LLD; Sporleder et al., AGU Spr 98) to the KI UZ, we took the shortcut of melting evolved rocks themselves in graphite at 5 kb. The resulting melts fail to form an LLD because they follow the rocks rather than lead them. Instead, liquid compositions produced from multiply-saturated runs are extraordinarily rich in mafic silicate and FeTi oxide components, with FeOT values approaching 33 wt\% at SiO2 41\%. FeOT values 23-33\% exceed all but one of those observed in 1-atm partial melts of Skaergaard rocks (McBirney and Naslund, CMP 104, 1990). Apatite, present in KI-UZ rocks, failed to crystallize from any liquids in this study. The excessive iron and lack of apatite may result from the effects of dissolved carbon in the melt from the graphite sample cups, which also increases the solubility of phosphorus in the melt (Weidner, CanMin 20, 1982; Lindsley et al., AGU Spr 99). The effect may be enhanced by the 5 kb experimental pressure, 2.7 kb higher than the estimated emplacement pressure of the KI. The most extreme effect was seen in sample KI3381, which showed high normative hy, mt, ilm, and di at the expense of ol and an. This result might be considered an Fe analogue of the high-pressure Kushiro-Yoder (JPet 1966) reaction 2Fo+An = Cpx+2Opx+Sp; i.e. 2Fa+An = Cpx+2Opx+Hc(in FeTi oxides). Both reactions release silica by the formation of oxide phases, silicating the olivine to the opx (here Fs) component in the melt. Pressure, as well as carbon, therefore, may play an important role in this reaction. Decompression of oxide-rich melts may
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