

Reconnaissance fluid inclusion study of the Morefield pegmatite, Amelia County, Virginia

JOHN R. SMEREKANICZ* AND FRANCIS Ö. DUDÁS†

Geological Sciences Program, Old Dominion University, Norfolk, Virginia 23529, U.S.A.

ABSTRACT

Over 90% of the fluid inclusions in quartz, topaz, and beryl from the Morefield pegmatite, Amelia Co., Virginia, contain mixed CO₂-H₂O fluids. In order of abundance, there are four inclusion types: (1) three-phase, l-l-v; (2) two-phase, H₂O-rich; (3) three- or four-phase, l-v-s and l-l-v-s; and (4) two-phase, CO₂-rich. CO₂-rich inclusions formed by necking of inclusions containing mixed fluids. Topaz and quartz contain all four inclusion types, and all types occur throughout the pegmatite, although no H₂O-rich inclusions occur in beryl. Quartz from gneiss that hosts the pegmatite contains dominantly H₂O-rich inclusions. Most inclusions are secondary and occur along healed fractures. Possible primary inclusions occur only among those that contain solids. All inclusions homogenize into the liquid phase; a few homogenize to liquid CO₂. H₂O-rich inclusions with <2 wt% NaCl (eq.) and homogenization temperatures <200 °C occur in the host gneiss and throughout the pegmatite and are interpreted to contain meteoric waters. H₂O-rich and mixed fluid inclusions with 3–7 wt% NaCl (eq.) and homogenization temperatures >290 °C contain fluids interpreted to derive primarily from the pegmatite. Inclusions with salinities between 3–13 wt% NaCl (eq.) and intermediate homogenization temperatures are in part cooled equivalents of the pegmatite fluids, but the origin of those with salinity >7 wt% NaCl (eq.) is uncertain. Homogenization temperatures for CO₂ indicate average CO₂ densities near 0.65 g/cm³. For mixed fluids homogenizing near 300 °C and this CO₂ density, the trapping pressure is estimated to be 2.5 kb. Neither age relations nor physical proximity tie the Morefield pegmatite to known granitic intrusions. Fluid compositions preclude a genetic relation between the pegmatite and its host gneisses.