

# Nature and Origin of Cornwall-type Clay Mineralization in Southwest Nova Scotia, Canada: The Black Bull Resources Inc. Yarmouth Silica-Kaolinite Deposit<sup>1</sup>

*D. J. Kontak<sup>2</sup> and K. Kyser<sup>3</sup>*

The southwestern part of the Meguma Terrane of Nova Scotia, underlain by ca. 370 Ma peraluminous granites and Cambro-Ordovician metaturbidites of the Meguma Group (MG), is well known for its granophile mineralization (e.g., East Kemptville Sn-Zn-Cu-Ag). However, recent exploration has delineated extensive reserves of silica-clay mineralization within the same granite batholith, some 10 km from the East Kemptville deposit. Initial reserves of ca. 15 Mt silica ( $\geq 98-99\%$  SiO<sub>2</sub>) and ca. 4.6 Mt kaolinite (80-85% brightness) are indicated for part of the 6 km strike length of the deposit (100 m depth), with exploration drilling and geophysical surveys indicating considerably larger reserves. The deposit occurs at the southern contact of the SMB with MG metasedimentary rocks and is confined to a northeast-trending brittle-ductile shear zone of  $\leq 1.5$  km width, with the mineralized zone  $\leq 200-300$  m wide. The intensely deformed (i.e., mylonitic) wall-rock biotite leucomonzogranite is progressively replaced by silica-clay rock, culminating in zones of  $>98\%$  SiO<sub>2</sub> and  $>60\%$  kaolinite; there is a border zone of quartz-kaolinite breccia and a core of quartz breccia. Paragenetically, early silicification and feldspar-destructive clay alteration is succeeded by repeated brecciation and quartz formation with concomitant increase in wt. % SiO<sub>2</sub>. Fluid inclusion studies indicate minimum entrapment temperatures of 141° to 218°C and salinities of  $\leq 0.8$  wt. % eq. NaCl; decrepitate analysis indicate a mixed Na-K fluid chemistry. Imaging of opened fluid inclusions indicates the presence of barite euhedra and kaolinite.  $\delta^{18}\text{O}$  analysis are +10 to +15‰ for quartz and +15 to +17‰ for kaolinite, whereas  $\delta\text{D}$  for kaolinite is -60‰ and -65 to -80‰ for quartz-hosted fluid inclusions. Interpretation of these data favours a two fluid mixing model involving magmatic and meteoric fluids with mineralization occurring at  $\leq 300^\circ\text{C}$ . Comparison with additional geological and geochemical information for strike-parallel mineralization in the area (e.g., Tobeatic Lake, Pb-Ag-Ba-Au) suggests that the mineralized zone is laterally extensive (i.e., 10's km), representing part of an extensive silica-clay-base and precious metal environment in southwestern Nova Scotia. The structurally-controlled mineralization probably occurred shortly after SMB emplacement with incursion of meteoric water along a vertically extensive and active fault structure.

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<sup>2</sup>Nova Scotia Department of Natural Resources, P. O. Box 698, Halifax, Nova Scotia, B3J 2T9; [kontakdj@gov.ns.ca](mailto:kontakdj@gov.ns.ca)

<sup>3</sup>Department of Geological Sciences and Geological Engineering, Queen's University, Kingston, Ontario K7L 3N6