Petrography and geochemistry of drill core from the Taylors Brook property in the Stirling belt, southeastern Cape Breton Island, Nova Scotia

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The Stirling belt in southeastern Cape Breton Island, Nova Scotia, is one of several belts of Precambrian rocks in the Avalonian Mira terrane of the northern Appalachian orogen. The belt consists of ca. 670 Ma volcaniclastic rocks, flows, porphyries, breccias, and clastic sedimentary rocks (Stirling Group), intruded by ca. 620 Ma dioritic to granitic plutons and overlain by Cambrian sedimentary rocks. This project is the first petrological study of rocks in core from three new exploration holes drilled in 2012, along with data from two holes drilled in 1991, to depths of 500 m at the Taylors Brook property, site of a copper- gold mineral occurrence in the southern part of the Stirling belt. Petrographic descriptions of the drill core and 58 samples in thin section showed that the rock types of the Taylors Brook property include quartz-feldspar porphyries, basalt flows, mafic and felsic tuffs, cherty ash tuffs, rhyolite, pyritic siltstone and hornfels, and correlate with rock units previously described at surface in the area. Over 500 analyses were obtained representing all rock types in the drill core using a portable X-ray fluorescence (XRF) instrument and an additional 27 whole-rock chemical analyses were obtained using inductively coupled plasma mass spectrometry (ICP- MS) with lithium metaborate/tetraborate fusion. These data were used in conserved element and Pearce element ratio (PER) studies of the basalt flows and the mafic dykes. The PER diagrams show that the basalts and the mafic dykes appear to have consisted originally of the same minerals and that the mafic dykes are more evolved and likely formed by crystal fractionation from the parent basalt magma. Preliminary assessment of the whole-rock chemical data suggests that the mafic and felsic rocks are calc-alkalic and formed in volcanic-arc setting. Sulphide minerals in 10 polished sections were analyzed by electron microprobe. The analyses show that the pyrite is the dominant sulphide mineral and that it is intergrown with chalcopyrite and sphalerite that result in elevated levels of copper and zinc in XFR analyses.

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