

## Petrological evidence for extensive liquid immiscibility in the Jurassic North Mountain Basalt, Nova Scotia

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The ca. 201 Ma North Mountain Basalt (NMB) represents a thick sequence of quartz-normative continental tholeiitic basalt erupted within a continental rift. Previous workers have subdivided the basalt sequence into lower, middle, and upper units. The lower unit is dominated by a thick ( $\leq 190$  m), massive flow, the middle unit ( $\leq 50$  m) consists of numerous thin (i.e., 5–8 m) flows, and the upper unit ( $\leq 160$  m) is dominated by a coarse, massive flow. Petrographically, the basalts are described as containing calcic plagioclase, augite, and rarer pigeonite and bronzite, and Fe-Ti oxides, and vary from holocrystalline to variably vitrophyric ( $\leq 30\%$ ). The local occurrence of thin (1–4 cm) rhyolite bands within pegmatitic gabbro and petrographic evidence of mafic-felsic silicate liquid immiscibility have previously been reported.

In the present study, samples of basalt from throughout the NMB stratigraphy were collected from Cape Split to Digby Neck for detailed petrographic and chemical study (electron microprobe, imaging analysis). The following features are noted. (1) The basalts are dominated by calcic plagioclase ( $An_{50-70}$ ), augitic pyroxene ( $En_{40-50}Wo_{30-40}Fs_{15-40}$ ), rare bronzite, and rare equant Fe-Ti oxides as an early liquidus phase. Glomeroclasts of plagioclase-pyroxene are rare. (2) The majority of samples contain a mesostasis, which is dominated

by skeletal Fe-Ti oxides, Fe-rich clinopyroxene, and apatite with associated granophyre. This mesostasis is interpreted to be a quenched basaltic melt. (3) Where clinopyroxene and plagioclase are in contact with the mesostasis, iron-rich pyroxene (to  $En_{10}Wo_{40}Fs_{50}$ ) and sodic plagioclase ( $An_{10}$ ) overgrowths occur. (4) A brownish-red to yellow glass occurs, which is locally inundated with dark brown to opaque, micron-size globules, frequently concentrated near adjacent plagioclase grains. Rarer homogeneous glass occurs with skeletal apatite grains. The average anhydrous analysis ( $n=13$ ) of this glass indicates a felsic composition (in wt. %): 75.3  $SiO_2$ , 0.65  $TiO_2$ , 11.6  $Al_2O_3$ , 3.85  $FeO$ , 1.51  $CaO$ , 0.11  $MgO$ , 4.83  $Na_2O$ , 1.61  $K_2O$ , and 0.44  $P_2O_5$ .

The petrographic and chemical features noted above are similar to those previously documented globally and considered to reflect the petrogenetic process of silicate liquid immiscibility within basaltic melts of quartz tholeiitic composition. The preponderance of these features within the NMB indicates that this process was pervasive. Extraction of these immiscible silicate liquids via filter pressing may account for the presence of rhyolite bands and sills of pegmatitic gabbro and pyroxenite in the NMB.