Origin of the pegmatites in the Hoskin Lake pegmatite field, Florence Co., Wisconsin

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The Hoskin Lake pegmatite field in Florence Co., Wisconsin, contains over 200 known pegmatites. Several of the larger ones reach up to 300 m, although most are more modest in size. Geochemically, they are highly evolved LCT-type pegmatites, with almost all belonging to the spodumene subtype. However, one large pegmatite can be classified as amblygonite subtype, whereas another large pegmatite shows affinities to spodumene, lepidolite, and elbaite subtypes. Petalite subtypes have been identified near the NW perimeter of the district only. Miarolitic cavities have not been found in any of these pegmatites, consistent with a relatively deep level of emplacement. Several pegmatites in the Hoskin Lake pegmatite field have been studied in detail, notably the Animikie Red Ace (ARA) and the King's X (KX) pegmatites. The surrounding country rock consists of amphibolite and quartz-muscovite schist. The ARA occurs mainly in Quinnesec quartz-muscovite schist (QQMS), and the KX occurs in Quinnesec amphibolite (QA). The ARA is very tourmaline rich and contains moderate amounts of Ta and Nb oxides minerals, very small amounts of phosphates and very low Ti. The KX on the other hand, is lower in tourmaline, very rich in Ta, Nb, Sn, and Ti-bearing mineral species and rich in phosphates. The surrounding amphibolite is rich in apatite and in high Ta-Nb-titanite. Titanite in the QA in the proximity of the pegmatite shows strong effects of mobilization. Slates outcrop locally and show evidence of halite hoppers, suggesting the existence of evaporites.

Based on the geographic distribution of the pegmatites and the Hoskin Lake granite (HLG), it may be tempting to suggest a genetic relationship between them. However two factors argue against such a genetic relationship: 1. the strongly contrasting mineralogy of the ARA and KX, 2. dramatic contrast between the pegmatite wall zones and granite.

The bulk chemistry of the HLG averages only about 13.8 wt % Al2O3 whereas the pegmatite wall zones as well as the QQMS average 20 wt % Al2O3. Spider diagrams of the quartz muscovite schist and amphibolite more closely resemble that of the pegmatite wall zones than that of the Hoskin Lake granite (Fig. 1). The HLG is higher in P2O5 and REE and is depleted in B and Li. The pegmatite wall zone of the ARA is low in P, elevated in Na, B, Li, and shows low K/Rb and K/Cs ratios. The K/Rb and K/Cs ratios are high for the HLG and intermediate to low for QQMS and QA.

A problem presents itself in determining a plausible origin of the pegmatites in the Hoskin Lake pegmatite field. Age determination data are only available for the granite (1.8 Ga) and the country rocks (2-2.2 Ga) and not for the pegmatites. The last regional thermal event was the Penokean orogeny which was essentially in its waning stages when the Hoskin Lake granite was intruded.

Considering the mineralogical and geochemical data available, it is highly unlikely that the pegmatites are fractionates of the Hoskin Lake granite. It is far more likely that the pegmatitic melts formed from partial melting of the QQMS and/or the QA caused by either the thermal effects of the Penokean orogeny or as a result of heating resulting from intrusion of the HLG.

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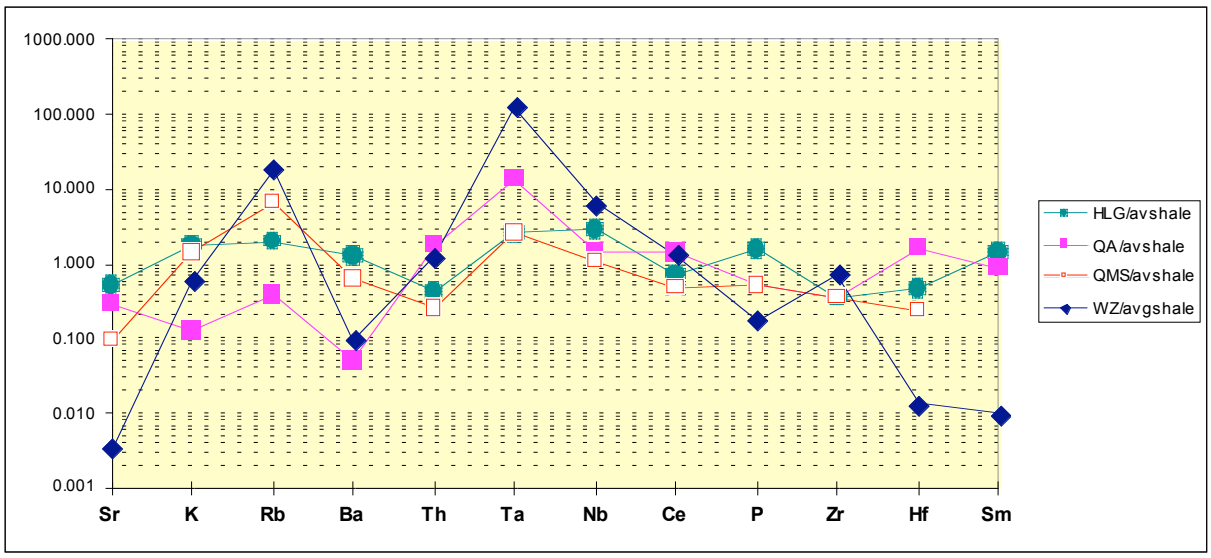

Figure 1: comparison of select elements versus average shale (avgshale) in Hoskin Lake granite (HLG), Quinnesec amphibolite (QA), Quinnesec quartz-muscovite schist (QMS), and ARA wall zone whole rock (WZ).