Geochemical and Petrographic Effects of Halo Formation in Host Rocks of Spodumene Pegmatites in Southeast Ireland

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The unexposed but extensively drilled spodumene pegmatites of South Leinster, southeastern Ireland, intruded the East Carlow Deformation Zone extending along the eastern margin of the ~400 Ma Tullow Lowlands pluton of the Leinster Granite. Metasomatic geochemical halos developed in the mainly granitic country rocks around spodumene pegmatites. However, the mineralogy and texture of halo minerals remains largely unknown, limiting their use in exploration. Whole-rock geochemical analyses of 117 country rock samples and petrographic observations from 141 thin sections are available to address this question and draw first conclusions. Certain characteristics of the system complicate the evaluation and interpretation of the whole-rock data. The most problematic of these are i) “invisible” pegmatites not cut by the drilling, creating pronounced halo mineralization in adjacent samples; ii) halo mineralization bound to locally confined fluid pathways, causing mixed signals in the respective samples, and iii) a likely unrelated alteration event, causing chloritization of biotite and seritization of feldspar, which potentially redistributed fluid-mobile elements like Li and Cs. In a cleaned data set (74 of the 117 samples), excluding chloritized, weathered, and immediate contact samples, Li contents are between 238 and 1,070 ppm. Plotted against the distance to the nearest mineralized pegmatite, Li, Sn, Mn, Cs, Rb, and Ta are distributed over their full compositional range in samples close to pegmatites, while they are restricted to lower values farther away. Plotting concentrations against the ratio of distance to the thickness of the nearest pegmatite shifts former outliers towards the above-mentioned distribution. Preliminary conclusions drawn from the results are that i) a careful petrography is necessary to evaluate and interpret whole-rock geochemical data, and ii) to track the geochemical halo signature, an in situ approach might be more fruitful as it will avoid possibly mixed and uninterpretable signals from whole-rock geochemistry.