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Carbonatitic REE-Nb-Fe mineralisation in the Palaeoproterozoic Shin Group marble and calc-silicates, Loch Shin, Scotland

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Carbonatitic magmatism and metasomatism are rare in Great Britain & Ireland. However, REE-Nb minerals were identified in impure marbles and calc-silicates on the Aird of Shin and Ariscaig near Lairg, Scotland. They belong to the Palaeoproterozoic Shin Group, a supercrustal succession of amphibolites, banded silicic gneisses, marbles and calc-silicates. The Shin Group is one of several Palaeoproterozoic to Neoproterozoic marble inliers in the North Highlands of Scotland that present evidence of Caledonian orogen carbonatitic metasomatism. The Proterozoic Bayan Obo ore complex in China was similarly deposited as a dolomite-limestone and later subject to alkali intrusions and carbonatitic metasomatism during the Caledonian orogeny. The Bayan Obo complex hosts REE-Nb-Fe carbonatitic fine-grained dolomites, REE-Nb deficient coarse dolomites, carbonatitic dykes, limestones and dolostones. The Aird of Shin marble mineralogy comprises niobium and tantalum Ca-bearing oxides, scheelite, strontian barite, ilmenite, REE-bearing monazite, REE-epidote and Fe-Mo sulphides in an impure Na-Fe-K calcite fabric. The Ariscaig Qtz-Na-K calc-silicates are enriched in REE-bearing monazite, Mg-Fe chlorite and Fe-oxides, with minor REE-bearing xenotime, Mn-Fe garnet and strontian barite. The REE-Nb Aird of Shin marble and the REE-phosphate bearing Ariscaig calc-silicates are comparable with carbonatitic mineral phases in the Bayan Obo complex. This study adds support to previous recognition of Caledonian carbonatitic magmatism and carbonatitic metasomatism of Proterozoic limestones and calc-silicates in Scotland.