

Prospective source rocks and accumulation processes for deposits of the REE Ion Adsorption Clay-type, Southeastern United States

ROBERT AYUSO* AND NORA FOLEY

United States Geological Survey, Reston, Virginia,
USA (*correspondence: rayuso@usgs.gov)

The Southeastern United States (SE-US) contains numerous high-silica anorogenic (or A-type) granitic suites, which constitute favorable source rocks for REE Ion Adsorption Clay (IAC) deposits because of their inherent high concentration of REE. These granites have undergone a long history of chemical weathering, resulting in thick granite-derived regoliths akin to those of South China, which supply virtually all heavy REE, Y, and a major portion of light REE to global markets.

Comparisons of granite regolith profiles formed on the Stewartsville, Suck Mountain, Striped Rock plutons, and the Robertson River batholith (VA) indicate that REE are mobile and can attain grades comparable to those of IAC deposits of China. The Stewartsville and Striped Rock regoliths highlight the importance of allanite weathering in generating light-middle-REE-enriched clays from metaluminous granite, whereas the Suck Mountain and Robertson River cases show the result of weathering of allanite plus a variety of REE-fluoro-carbonate minerals formed under peralkaline conditions in pegmatitic melt fractions.

Compositional ranges of large igneous suites of the SE-US [1] generally match those of A-type or highly fractionated I-type granitic rocks associated with South China IAC deposits [2]. One prominent feature we recognize in many granites having REE-mineralized regoliths is the tetrad behaviour displayed in REE chondrite-normalized patterns of both granite and regolith. Tetrads result from processes that promote redistribution, enrichment, and fractionation of REE such as late- to post-magmatic alteration of granite and silicate hydrolysis in regolith. Thus, REE patterns showing tetrad effects may be a key for discriminating highly prospective source rocks and regoliths with potential for REE IAC deposits. Our studies demonstrate potential in the SE-US for REE IAC deposits of the type containing light-middle REE and Y. Establishing the extent of the resource potential will depend on identifying sufficient volumes of regolith with high concentrations of readily extractable, high-value REE.

[1] Foley & Ayuso (2015) BCGS Paper **2013-3** 131-138. [2] Wang *et al.* (2015) OGR **64** 569-582.