Goldschmidt 2026 Abstract
https://doi.org/10.46427/gold2026.33709

Petrochemical and geochronological evidence of Albitization-Driven Formation of White Aplite and Albitite from Gneisses in the Gakara Region, Western Burundi (East Africa)

MR. DIEUDONNÉ NIVYAYO[1], ASHIMA SAIKIA[1], IVAN BELOUSOV[2] AND SECONDE NTIHARIRIZWA[3]

[1]University of Delhi
[2]CODES, School of Natural Sciences, University of Tasmania
[3]University of Burundi

The Gakara region of western Burundi records extensive hydrothermal albitization affecting Mesoproterozoic metasedimentary rocks intruded by granitoids (granites and gneisses) of the Karagwe–Ankole Belt (ca. 1381 Ma). The granitoid gneisses were overprinted by pervasive feldspar albitization associated with dequartzification/episyenitization at ca. 614 ± 12 Ma. Progressive hydrothermal metasomatism at the expense of the gneisses produced fenitic rocks ranging from partially albitized varieties, herein termed white aplites based on their colour, mineralogy and fine-grained texture, to nearly pure albitites.

White aplites and albitites are characterized by pronounced depletion in large-ion lithophile elements (LILE; Cs, Rb, Ba, Sr), reflecting the destruction of K-feldspar, and by generally low contents of high field strength elements (HFSE; Ti, Nb, Ta). In contrast, albitites display significant enrichment in HFSE such as Th, U and P, as well as light rare earth elements (LREE; La, Pr, Nd, Sm), indicating progressive acquisition of these elements during advanced albitization. Total REE contents in albitites (ΣREE = 399.73 - 605.68 ppm) are markedly higher than in white aplites (ΣREE = 34.35 - 278.64 ppm). Both lithologies show LREE enrichment relative to HREE, with La/Sm ratios of 0.70-7.49 in white aplites and 5.01-5.57 in albitites, and Gd/Yb ratios of 0.32-2.53 and 3.54-3.90, respectively. Moderate negative Eu anomalies are observed in both rock types (Eu/Eu* = 0.40-0.83 in white aplites; 0.60-0.68 in albitites).

Geochronological constraints indicate that hydrothermal albitization at 614 ± 12 Ma slightly predates, or closely overlaps with, the REE mineralization event at 602 ± 7 Ma. These ages suggest the development of a long-lived hydrothermal system operating around ca. 600 Ma, lasting from a minimum of ~7 Ma to potentially more than 30 Ma. This system is interpreted as part of a geodynamic continuum related to Pan-African tectonothermal processes in the Karagwe-Ankole Belt, linking large-scale metasomatism, fenitization, and REE mineralization.