



# GEOGULF2021

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## Waste Not, Want Not: Potential Contributions to U.S. Critical Minerals Supply from Expatriated Bauxite Residue

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### ABSTRACT

Texas production of alumina from bauxite principally sourced from Jamaica occurred from 1953 until 2016 with refinery locations adjacent to estuaries on the middle Texas coast at Point Comfort and near Corpus Christi. Total processed bauxite from those years of operation are estimated to be approximately 326 million metric tons, with an estimated waste ratio of 50–60%. Red muds, the residual waste after alumina extraction from bauxite, constitute an estimated 163 million metric tons of stored materials at these sites. The red muds commonly have a pH of 10 to 12 due to residual NaOH and typically are stored in permanent disposal sites that extend over several square kilometers. Currently, there are no major uses for red mud, and its caustic nature creates potential environmental hazards. These potential effects are amplified in storage locations like the Texas coast that are subject to tropical cyclone-related storm surge and flood, as well as effects related to long-term relative sea level rise. With the recent push by the US government to find local sources of critical minerals, bauxite residue has new potential to be reprocessed into useful materials. Red muds have been shown to be enriched in rare earth elements (REEs), as the majority of REEs and other metals such as gallium and scandium are transferred to bauxite residue during the Bayer process. Red mud from various deposits ranges from 500–1700 ppm REE and 30–80 ppm gallium. Existing data for Jamaican karst bauxite and its wastes have shown that bauxite residue may be enriched by a factor of 2–5X during the Bayer process, up to 2775 ppm REE+Sc, which is more than 10X the content of a typical granite. Further, some bulk bauxite residue has been converted into useful construction materials, suggesting the potential for reduction of the total stored waste.

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## NOTES

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