

A Textural, Mineralogical, and Statistical Study of the Footwall Breccia within the Strathcona Embayment of the Sudbury Structure

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Abstract

The footwall breccia is one of the main Ni-Cu-(PGE) ore-hosting units of the Sudbury camp. This polymict, matrix-supported, contact-metamorphosed breccia occurs between the Sudbury Igneous Complex and the footwall rocks along the west, north, and east margins of the Sudbury structure. In areas where there are depressions or embayments in the footwall, the footwall breccia and basal units of the Sudbury Igneous Complex are thickened, and the footwall breccia is variably mineralized. Mineralogical and textural variations of footwall breccia samples from the Strathcona embayment in proximity to the Fraser mine suggest that the mineralogy and texture of this unit vary as a function of proximity to the Sudbury Igneous Complex, proximity to ore, and location within the embayment. The most mafic footwall breccia mineralogy is present proximal to the base of the Sudbury Igneous Complex within a transition zone. The presence of relatively mafic, hydrous, and Cl-rich silicate minerals (e.g., biotite and amphibole) characterize the footwall breccia matrix around ore zones and form an alteration halo of up to 5 m thick. Textural variations include a coarsening of quartz and feldspar grains with increasing proximity to the Sudbury Igneous Complex contact. Textural coarsening also occurs from the margins of the Strathcona embayment to the center. Together, these mineralogical and textural variations influence the color of the footwall breccia matrix and can explain some of the gray colors that are typical of mineralized footwall breccia. These variations also constrain the timing of formation of this unit and suggest that at least three phases of footwall breccia exist.