PROGRESSIVE ALBITISATION IN THE "MIGMATITE CREEK" REGION, WEEKEROO INLIER, CURNAMONA

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Statement of Authenticity

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Cheng Lin Yang

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ABSTRACT

Albitisation is pervasive and intense in the Curnamona Province. Most FeO-Cu-Au-U-REE deposits are associated with sodic alteration or albitisation (alkaline alteration) worldwide. The minor Cu-Au-U-REE mineralisation occurs in the large albitisation system in the Curnamona Province. Progressive albitisation allows us to demonstrate the mobility of metals linked to mineralisation in the Migmatite Creek, Weekeroo Inliers, Curnamona Province.

Lithological and thematic mapping of albitisation intensities distinguishing low-, medium-, and high- grade albitisation was carried out in the Migmatite Creek area using ArcGIS mapping tools. Progressive albitisation was investigated using whole rock, electron microprobe and Laser Ablation ICPMS analytical methods to establish major, trace and rare earth element variation on a range of scales in bulk samples and individual mineral phases.

Albitisation is structurally controlled by OD_3 antiformal folds and development of a network of breccias creating pathways of fluid flow. Intensities of albitisation decrease from antiformal to synformal fold hinges. Mass balance estimates, using isocons allow a semi-quantitative view of the evolution of fluid and rock compositions and the mobility of elements during progressive albitisation. The evolution of temperature was independently identified by using mineral geothermometers. Mobility of rare earth element (REE) resulted in extreme changes of REE patterns during progressive albitisation. The initial albitisation fluids were identified in the range of hypersaline (approximately 30 wt% equi. NaCl) with the NaCl rich - CO_2 - KCl - $MgCl_2 \pm Al(OH)_x \pm CaCl_2$ - H_2O was related to regional fluids of metamorphism and migmatisation. 87 % of Eu and 99% of La were removed from psammites to fluids during high intensity albitisation. Most of the siderophile elements, Ni, Co, Cr, Mn and Mo, as well as Zn, Ba and Sr, were removed from unaltered rock to the fluids in the area.

The chemical equilibria of fluid/rock reaction were completely attained between quartz and albite during high–medium intensity albitisation against uncompleted equilibria in low intensity albitisation. New albite +quartz + accessory minerals replaced the original quartz + feldspars + biotite + magnetite assemblages. Progressive albitisation resulted in evolution of fluids and then lead to a secondary stage biotite alteration and a weak quartz alteration (inserted quartz veins). Fe – U – REE elements were extremely removed from all types of lithologies (metasediments and pegmatites and amphibolites) during progressive albitisation. A highly charged, metal fluid was formed during albitisation. Albitisation has great potential as a source process for mineralisation and from its characteristics shows links to the IOCG-REE systems.

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