

ALKALI METASOMATISM IN THE SHOEMAKER IMPACT STRUCTURE, AUSTRALIA

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The Shoemaker Impact Structure (SIS) is Australia's oldest known structure. It is approximately 28 km in diameter, deeply eroded, and its age is constrained by a whole rock isochron of 1630 Ma from rocks in the central uplift. The structure is defined by a ring structure syncline consisting of the lowermost sedimentary units of the Palaeoproterozoic Earraheedy Basin. The syncline surrounds a core of silicified and metasomatised granitoid rocks, which forms the central uplift of the SIS. Petrographic and geochemical studies indicate that a 2.6 Ga granitic precursor rock was extensively altered first by alkali metasomatism and subsequently by silica-rich fluids. Alkali metasomatism resulted in the total conversion of the precursor into a quartz-albite \pm aegirine rock (Na metasomatism), overprinted by microcline (K metasomatism). The metasomatised products resemble fenitized rocks associated with carbonatite ring complexes. At a later stage, the metasomatised rock was invaded by silica-rich fluids which resulted in silicification and quartz veining. I interpret these alteration events as due to post-impact hydrothermal activity related to a melt phase, located well above the present level of exposure. This melt phase affected basement granitic rocks in the central uplift and acted as a heat source, which channelled fluids downward. Alkali elements were extracted from the shock-thermal decomposition of feldspar, mica and quartz. This impact-related alkali metasomatism may explain the common occurrence of syenitic-like rocks associated with mega-impacts.