"FLINDERSITES", DISTANT EJECTA IMPACTITES FROM SOUTH AUSTRALIA; V. A. GOSTIN and M. ZBIK Department of Geology and Geophysics, University of Adelaide, Adelaide, South Australia 5005.

Several clasts of dark red and strongly shattered dacites have been collected from the unique distant ejecta layer of the Lake Acraman meteorite impact structure [1]. Such clasts are extensively distributed along the iridium anomaly-bearing sedimentary horizon within the Precambrian Bunyeroo Formation outcropping in the central Flinders Ranges [2,3]. Petrology and chemical composition of feldspars from two clasts of distinctly different size have been studied. Results have been compared with chemical compositions of feldspars from pre-impact unshocked dacites (sample1) and dacites from the central part of the Lake Acraman impact structure (sample 4).

Two clasts about 4cm (sample 2) and 40cm (sample 3) in diameter are dark red and strongly shattered (Fig.1). Hand specimens show a porphyritic texture, while in thin section large euhedral and subhedral phenocrysts of plagioclase, and rarely small quartz crystals are surrounded by a felsic matrix. Numerous cracks cross the phenocrysts and matrix. Green assemblages of fibrous chlorite which replace probable pyroxene are common, and small apatite crystal occur. Calcite, dolomite and Cu-bearing secondary minerals fill the porous system.

Numerous quartz crystals show multiple planar deformation features, many being decorated, probably by stishovite (Fig. 2). Plagioclase feldspar phenocrysts often display planar deformations, undulatory extinction and partial isotropization. Such isotropization probably led to maskelynite formation. Isotropic and partly isotropic felspar grains are present in the matrix. Irregular pink dark turbid patches showing wavy extinction are sites of devitrified melt pockets and mixed melt along grain boundaries. All these features demonstrate that the studied samples were altered by shock metamorphism whose magnitude could be estimated as moderately shocked (shock stage S4), with shock pressures between 10 and 30 GPa [4].

Microprobe analyses showed the chemical composition of feldspars in both clasts were equilibrated and uniform. Large phenocrysts contain albite-rich plagioclase $Or_{0.5}Ab_{97.9}An_{1.6}$ with intergrowths of potassic felspar $Or_{96.8}Ab_{1.}An_{2.1}$ which dominate in the matrix.

In the studied samples, the K_2O/Na_2O ratios in albite show the opposite effect from that in orthoclase (see Fig. 3a and 3b). These ratios usually increase from target rocks to impactites, but in many cases the opposite tendency has been observed [5]. Enrichment of potassium occurs in albite whereas enrichment in sodium is noted in orthoclase. Perhaps during impact processes potassium in orthoclase and sodium in albite as the major elements have left the mineral structure quicker than the minor elements. A continuous sequence of chemical alterations are shown in Fig. 3c and 3d, where significant increases of the ratio SiO_2 and Al_2O_3 to volatiles suggest that samples chosen for investigation form a sequence within the same single impact event.

The uniqueness of such objects, which, for the first time have been found far away from remnants of the parent meteoritic impact structure, suggest that they be given a special name of "FLINDERSITES" from the mountain range where they occur. Furthermore, the similarity in origin between Flindersites and meteorites from the Moon and Mars provides a special occasion to study links between them.

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Fig. 1 Largest Flindersite from Bunyeroo Gorge, Flinders Ranges. Scale bar 35 cm.

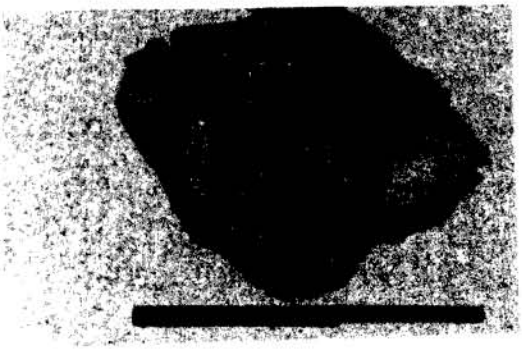

Fig. 2 Planar deformation features in quartz crystal within Flindersite.

Fig. 3 Ratios of chemical components from (1) pre-impact dacite, (2) small and (3) large Flindersites, and (4) centre of Acraman impact structure.