Minerals of Jenolan Caves - Geosphere Meets Biosphere

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Jenolan Caves, discovered in 1838, is one of the premier tourist attractions of NSW, located 182 Km west of Sydney, in the main Dividing Range. The caves are developed in the N and S sides of a natural bridge (The Grand Archway) in folded, near vertical late Silurian limestone.

Interactions between the geosphere and biosphere have formed a range of mineral species, some not previously reported from Jenolan. One suite has resulted from mainly geological processes - illite, kaolinite, goethite, hematite, aragonite, hydromagnesite, huntite, dolomite, montmorillonite, and gypsum; while another has been formed from interactions between geological and biological processes, through the activities of bats and wallabies - ardealite, gypsum, hydroxylapatite, taranakite, crandallite, montgomeryite, niter and sylvite (Colchester et al., 2001). Some caves have remnants of a later ferroan dolomite palaeokarst infill (Carboniferous to Permian age?) containing minor oxidised pyrite (Osborne, 1999).

This study has produced the most significant advances in Jenolan mineral studies since the work of Mingaye (1899), providing data on the formational processes of the cave system. The study used a variety of analytical methods - X-ray diffraction, ultra-violet photography, EDS analysis, fluid inclusion thermometry, XRF, sulfur isotope studies and K-Ar clay dating.

Two important aspects of the study have included a detailed geodiversity survey of Ribbon Cave, and relocation of Mingaye’s mineral sites for application of modern analytical methods. The Ribbon Cave survey revealed for the first time the presence of huntite growing from the ends of aragonite helictites and spheres of acicular aragonite (“stars”) in weathered wall rock.

Research published so far (Colchester et al. 2001) focused on an evaporite deposit in the Grand Archway in which niter occurs in association with sylvite, but not halite. This is attributed to evaporation taking place close to freezing temperatures during the winter.

Sulfur isotope studies of Jenolan gypsum and ardealite gave two separate groupings, interpreted as sulphur from (i) decay of pyrite in ferroan dolomite palaeokarst (low values, $\delta^{34}S$ 1.4 – 4.9) for one gypsum suite; and from (ii) biological (possibly bat guano) origins (high values $\delta^{34}S$ 11.4 – 12.9) for ardealite and associated gypsum.

REFERENCES


