Evidence that some microgranitoid enclaves are felsic magma cumulates.

R.H. FLOOD[1] AND S.E. SHAW[1]

[1] GEMOC KEY CENTRE, Department of Earth and Planetary Sciences, Macquarie University 2109, NSW, Australia.; rflood@els.mq.edu.au; sshaw@els.mq.edu.au

Granite Enclaves

Three main types of enclaves can be recognised in granitic rocks. Some, though not abundant, are metamorphic rocks (quartzites and gneisses). Some, that can be locally abundant, are extremely fine grained igneous rocks, have chilled margins, and are, with little doubt, mafic magma sheets or globules quenched in the felsic magma. The majority, are microgranitoid enclaves (MGE), that have medium grainsize igneous microstructures, have no chilled margins and virtually all are as mafic or more mafic than the host. While outcrops that record the sites of mafic magma injection and quenching have been well-documented, many enclaves of this type are commonly found in outcrop in association with the other two types as disordered accumulations. The site of enclave accumulation (that can include all three types) appears unrelated to the position in the magma chamber where they formed, and are therefore analogous to palaeontological "death assemblages" .

MGE as cumulates from felsic magmas.

Observations relevant to the origin of MGE include: MGE in S-type granites are generally S-type; in general $^{87}Sr/^{86}Sr$ initial ratios are similar to the host; generally the MGE have the same minerals as the host but in different proportions; some have minerals that could not have crystallised from a magma of the bulk composition of the MGE; many MGE have epsilon $^{176}Hf/^{177}Hf$ values lower than the host [2]; some have abundant phenocrysts that are the same size and composition as those of the host or are minerals that might be expected to be near-liquidus phases in a magma of that composition. The recognition that many granitic plutons have significant isotopic variation, and that in at least one zoned pluton, it is the felsic core that is the most isotopically primitive leads to the suggestion that primitive isotopic ratios do not necessarily mean mafic compositions. It is argued that many MGE are not thermally quenched mafic magma globules but are cumulates formed near the roof of the magma chamber as rafts of crystals that heterogeneously nucleated on phenocrysts during pressure quench events.