

Microstructures as key to Mechanics of Superposed Deformations in the Palaeoproterozoic Sakoli Group, central India.

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Microstructural studies indicate four folding events (F_1 to F_4) in the poly-metamorphosed (M_1 and M_2 ; c.4.5 Kb, $545 \pm 15^\circ\text{C}$) Palaeoproterozoic (c.2.0 Ga) Sakoli Group in central India. Overprinting of foliations, deformation of annealed microstructures, deformation-metamorphism interrelationship, porphyroblasts with complex inclusion patterns and porphyroblast-matrix microstructural relationships support a polyphase sequential deformation history. Several competing deformation mechanisms operated in different lithological domains over a progressively mobile strain-time path forming a wide spectrum of microstructures. The slaty cleavage, S_1 shows evidence of early solution-strain followed by exhaustive syntectonic metamorphic recrystallisation during M_1 . Crystal-plastic strain and metamorphic grain growth by grain-boundary migration and thermal diffusion dominated the final stages of M_1 that outlasted F_1 . A ductile shear zone also developed during late- F_1 stage. Within this shear zone, quartz underwent syntectonic dynamic recrystallisation producing an oblique foliation and also pure quartz layers where plastic deformation and strain localised. Plagioclase progressively broke down to form fine-grained mica by syntectonic softening reactions. K-felspar, mica and kyanite deformed by cataclastic flow and kinking with formation of "fish". During F_2 , a secondary banding with alternate sub-planar quartz-mica and mica-rich domains developed parallel to S_2 with loss of volume. S_i - S_e tectonites indicate five periods of S_2 development when solution-creep, grain boundary sliding and metamorphic re-crystallisation dominated.