

A Note on the Occurrence of Orbicular Rocks in Bundelkhand Granitoid Complex

Orbicular structures from the Bundelkhand Granitoid complex in Banda District, Uttar Pradesh are reported for the first time.

Orbicular rocks have been reported from several localities of the Peninsular shield in recent years (Srikantia, 1994; Srinivasan, 1995; Prakash, 1996).

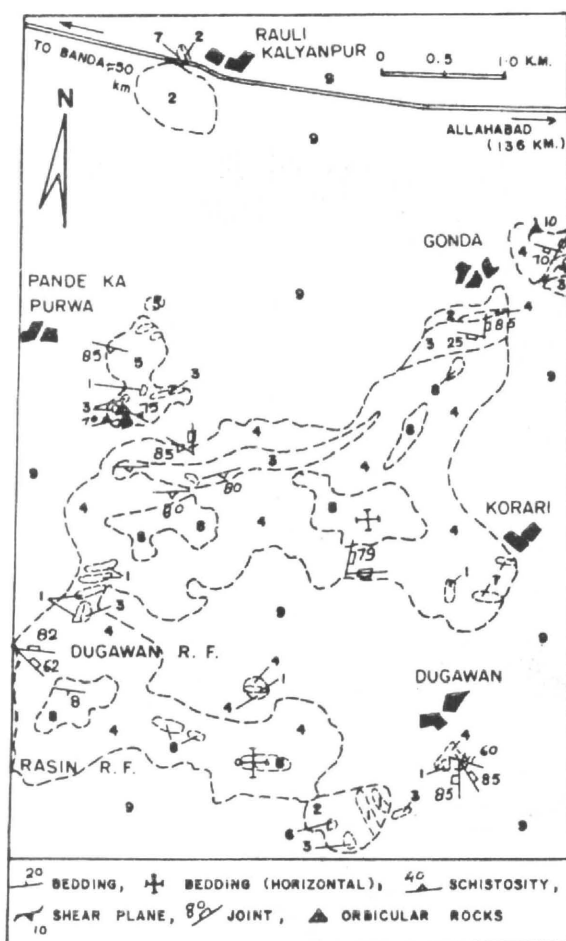


Fig.1. Geological map of part of Bundelkhand Granitoid Complex around Rauli Kalyanpur area, Banda district, U.P. 1. Enclave rocks; 2. Porphyritic granitoid suite; 3. Foliated grey granitoid; 4. Foliated greyish-pink granitoid; 5. Foliated pink granitoid; 6. Leucogranite; 7. Basic intrusives; 8. Vindhyan Supergroup of rocks; 9. Alluvium.

This note reports the first record of orbicular structures from the Bundelkhand Granitoid Complex. The orbicular rock is exposed on a quarry face of a foliated grey granitoid to the south of Rauli Kalyanpur (Fig.1.), Banda district, U.P. It occurs as a linear outcrop with 1.5 m width and its lateral extension is not known since major part of the area is covered with alluvium.

The exposures examined show the presence of a mafic enclave and orbicules (Leveson, 1966) in a mica-bearing feldspar + quartz groundmass. Structurally, the various orbicules observed include: proto-, single-shelled, and multi-shelled orbicules with regular shell spacings. The orbicular rock is deformed as majority of orbicules are flattened and foliation cuts across the shells. The core composition is similar to the matrix in terms of phase assemblage, although the concentration of mafics vary.

The size of the orbs range between $3.4 \times 3.3 \text{ cm}^2$ to $6.5 \times 4.5 \text{ cm}^2$ and their shapes vary from sub-spherical to ellipsoidal (Fig.2). At places these are fragmented/truncated (Elliston,

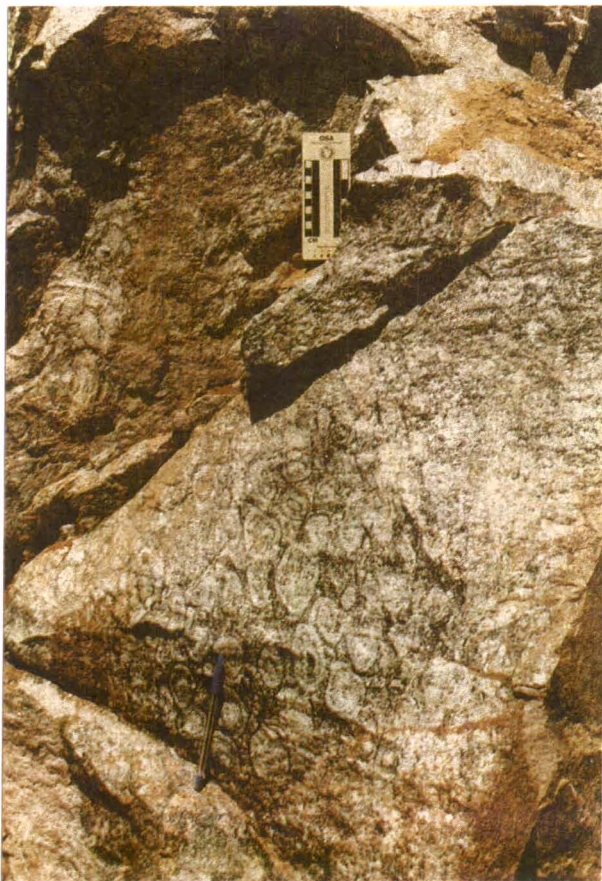


Fig.2. Orbicular rock and the host as observed in the outcrop.

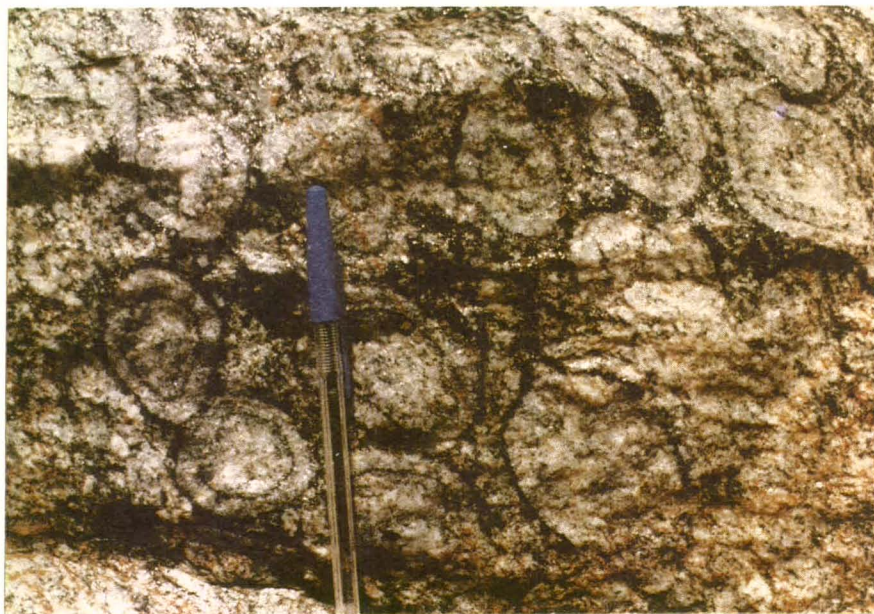


Fig.3. A close-up view of the multi-shelled and proto-orbicular structures. Note the effect of deformation.

1984) in nature probably due to partial assimilation of proto-orbicules with the matrix. The composition of the core is dominantly plagioclase-rich and a few are composed of biotite. The number of shells vary from one to four with nearly regular spacings. The successive phase assemblage in these shells vary and majority of the orbicules show a biotite-rich rim of a few mm thickness at the outer margins. The phases present in the core include: plagioclase (oligoclase) + quartz + biotite + chlorite + apatite + opaque. The shells are composed of plagioclase (oligoclase) + quartz + biotite + chlorite + apatite + zircon + epidote + opaque. Microscopic observations reveal that the composition of plagioclase remain nearly same from outer shell to core but there is a gradual increase in the concentration of plagioclase component towards core. Quartz is recrystallized and contains numerous fluid inclusions. Plagioclase shows antiperthite texture in the core of some of the orbicules due to potash-metasomatism. The chemical analysis of this orbicular rock (orbicule + matrix) by XRF technique shows the following major oxide content (weight percent): SiO_2 : 69.99, Al_2O_3 : 14.83, Fe_2O_3 : 2.42, FeO : 0.42, MnO : 0.02, MgO : 0.53, CaO : 2.76, Na_2O : 6.29, K_2O : 1.29, TiO_2 : 0.21, P_2O_5 : 0.06 and L.O.I.: 0.88. Preliminary findings indicate that the rock is medium-K type, metaluminous, of calc-alkaline affinity, and plots in the granodiorite field in terms of major oxide concentration.

Field observations coupled with petrographic studies suggest that the orbicules have possibly formed due to the incorporation of hydrous mafic enclave rock into the medium-grained, grey granitoid in a superheating situation (Vernon, 1985). However, detailed studies are currently in progress for obtaining a clearer picture of the origin of these orbicules.

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