Palaeozoic granites and their younger components - A study of Mandi and Rakcham granites from the Himachal Himalaya

A Kundu*, NC Pant and Sonalika Joshi

* For correspondence, email: akundu62@rediffmail.com

Geological Survey of India, NIH-5P, NIT Faridabad-121001, Haryana, INDIA

Several occurrences of Palaeozoic granites are recorded from the Lesser Himalayas as well as from the Higher Himalayas (Miller et al. 2001). From Himachal many such bodies have been dated (Bhanot et al. 1979, Frank et al. 1977, Jager et al. 1971, Kwatra et al. 1986, Pognante et al. 1990, Kwatra et al. 1999, Kundu et al. 2006). All of these bodies are deformed and several occur in the vicinity of Main Central Thrust (MCT). Studies have indicated presence of more than one granite type in most of these occurrences (e.g. Gupta 1974, Chatterjee 1976) but definitive reference to the Himalayan orogeny has generally been lacking. The present work supplements the earlier field and petrographic classification with rigorous mineralogical including rare earth element (REE) bearing mineral data for the two Palaeozoic granites of Mandi and Rakcham and show association of younger granites with these occurrences.

Four petrographic variants of Mandi granites can be identified (Chatterjee 1976). These are as follows.

1. Porphyritic granite: With two mica and two feldspar. The ratio of the micas number to feldspar phenocryst vary. The other mineral phases are quartz, ilmenite, sphene, epidote, zircon, secondary muscovite, chlorite, monazite, allanite, zircon, apatite and fluorite.

2. Fine grained porphyritic granite: Two mica two feldspar granite and mineralogy similar to the porphyritic granite but has distinctly finer ground mass size and less phenocrysts.

3. Trondhjemite/albite granite: Leucocratic rock with one feldspar (albite) and one mica (muscovite). Other minerals are quartz, rare biotite, chlorite, wolframite, iron oxides, monazite, fluorite, apatite and tourmaline.

4. Leucogranite/tourmaline granite: Two feldspar and one mica (muscovite) granite, some outcrops have significant amount of tourmaline (more than 1%). Quartz, k-feldspar, albite, tourmaline, muscovite, fluorite, monazite etc. In Rakcham occurrence three variants are identifiable namely 1. porphyritic granite: two felsps biotite granite, 2. granodiorite and 3. trondhjemite. The latter two variants are subordinate and the major constituent is the porphyritic granite. Magma mingling is indicated by the presence of mafic pillows in the Mandi occurrence (Miller et al. 2001). This process has been carried out in a nodule granite enclosed within quartz, chemical age determination yielded an age of 462 Ma with a standard deviation of 44 Ma (Kundu et al. 2006). This compares well with the reported 433±9 Ma for the Akpa, a granite body possibly part of Rakcham granite and 477±29 Ma for Rakcham (Kwatra et al. 1999). Indications of Tertiary ages is obtained from two samples in the Rakcham area thus describing coexistence of Himalayan granite in this Pan-African age granite complex. In Mandi, the dominant granite (porphyritic granite) gives Pan-African age (514 Ma with a standard deviation of 44 Ma), which compares well with the reported age data for this occurrence (Jager et al. 1971, Mehta 1977, Miller et al. 2001). However, effects of resetting of ages of monazite and commensurate mineralogical transformations record imprints of Tertiary geological events. It is possible that besides the presence of Tertiary granite, formation of trondhjemite may also be linked to the Himalayan mountain building processes in Mandi and Rakcham occurrences.
References


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