

Petrography and preliminary geochemistry of alkaline mafic dykes in the Nagar Parkar igneous complex, southeastern Sindh

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The Nagar Parkar Igneous complex comprises a series of late Proterozoic granitic rocks emplaced in a basement of amphibolitic rocks. These have been intruded by steeply dipping mafic dykes that are locally in swarms of parallel sheets or networks. Individual dykes are generally no more than a 5 m in thickness and 300 m in length, but some are larger and up to 2 km in length. Our recent field studies show that the mafic dykes themselves are locally intruded by granitic dykes; leading to assume that the latest phase(s) of the granitic magmatism overlapped with the mafic magmatism.

The mafic dykes may have chilled margins, and show considerable mineralogical and textural variations. They are fine- to medium-grained and holocrystalline to hypocrySTALLINE; many are porphyritic and some display flow alignment in phenocrysts. One of the dykes in the Ranpur area contains up to 8 cm long, euhedral to subhedral plagioclase phenocrysts in medium- to fine-grained matrix and another near Karai shows some layering which is unusual, considering the small size of the body. The dykes can be divided into two groups on the basis of the principal mafic mineral: amphibole-bearing and titaniferous augite-bearing. Both the types contain zoned plagioclase (labradorite-andesine, commonly saussuritized), opaqueoxide, sphene, apatite and secondary minerals. Some of the augite-bearing rocks also contain olivine. Field relations are not clear, but the amphibole-bearing dykes appear to be older than the augite-bearing group.

Major element geochemistry suggests that the two groups are not different significantly. Analyzed rocks are alkaline and characterized by high TiO₂ and Na₂O+K₂O contents. Fourteen of the 15 analyses are olivine-normative, with six also being nephelene-normative. Trace element and REE analyses of two pyroxene-bearing and one amphibole-bearing dykes show that the latter is enriched in all the trace and RE elements. However, their mantle normalized trace element and chondrite normalized REE patterns are similar. They show distinct troughs for K, Ce, P, and Ti, and positive spikes for Ba-Rb, Nb-Ta, Sr, Sm-Zr, and Y and have some similarities with continental alkali basalts. Chondritenormalized patterns show depression on Ce, Sm, and Dy, and rise on Nd, and, in the case of the augite-bearing samples, Eu and Ho. Thus, the two groups of rocks may have been derived from two magmas of rather similar composition and from the same source region.