where

$$H = \frac{l^*}{l} \quad \text{and} \quad q = -\left(\frac{l^{**}}{l}\right) \frac{1}{H^2}$$

The reality[3] conditions $(\rho + p) > 0$ and $(\rho + 3p) > 0$ demand that $H^2(1+q) > \sigma^2$ and $3qH^2 > 2\sigma^2$.

The explicit form of the function R can however be determined by assuming an equation of state. For example in the case of incoherent fluid distribution $p = 0$ gives $R = (aT+b)^{2/3}$ where a and b are arbitrary constants of integration. For this value of R from equations (5), (6) and (7) we get

$$8\pi\rho = \frac{4a^2}{3(aT+b)^2} \times 1 + \left(\frac{\alpha}{(1+\beta x)a(aT+b) - \alpha}\right) \tag{10}$$

$$\theta = \frac{a}{(aT+b)} \times 2 + \left(\frac{\alpha}{(1+\beta x)a(aT+b) - \alpha}\right) \tag{11}$$

and

$$\sigma^2 = \frac{\alpha^2 a^2}{3(aT+b)^2\{(1+\beta x)a(aT+b) - \alpha\}^2} \tag{12}$$

From the above equations we see that the relative rate of the fluid shear σ^2/θ^2 and the density contrast $\partial/\partial x(\log \rho)$ both tend to zero as $T \to \infty$ which indicate that the model ultimately evolves to the isotropic and homogeneous structure.

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ZIRCONS IN QUARTZOFELDSPATHIC GNEISS FROM KOTTAYAM DISTRICT, KERALA

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ZIRCONS are physically as well as chemically resistant to geological processes, and, therefore, their morphology has been statistically studied for years to interpret the history and petrogenesis of rock formations[1-4]. The present study is based on the fact that the morphological characters of zircons are reflections of the varied physicochemical environments of formation of the rocks. The paper pertains to the gneissic rock associated with the migmatised charnockites and allied gneisses in the Western Ghat section at Mundakkayam in Kottayam district, Kerala.

LOCATION AND GEOLOGICAL SETTING

The rock under discussion has been collected from the banks of Manimala river at Mundakayam (76° 53′ 5″: 9° 32′ 15″) in Kottayam district Kerala. The area in and around this location belongs to the Precambrian terrain containing migmatised charnockites and its variants as the major lithological units, and also granitic gneisses, quartzofeldspathic gneisses and lenses of pink feldspathic granites. These rocks are cut across by dolerite and gabbro dykes. The quartzofeldspathic gneiss is conformable in trend to the adjoining charnockitic variants. The general trend is nearly N-S with 55° easterly dip.

PETROGRAPHY

The rock is leucocratic, medium to coarse-grained and gneissic in texture. It contains quartz and feldspar; biotite is the dominant ferromagnesian mineral which imparts the gneissic fabric.

Texturally, the rock is medium to coarse grained and inequigranular, showing feeble gneissose texture. Quartz is anhedral and feldspar dominates over quartz. The plagioclase feldspar ranges in composition from oligoclase to andesine. Antiperthitic and myrmekitic growths are also observed. Feldspars seem to be of two generations, the earlier one exhibits well-developed twinning and the latter one is devoid of twinning. The major mafic constituents are green and brown biotite. Accessories include zircon, apatite and opaques.

STUDIES ON ZIRCONS

Recovery of zircons: Zircons are separated from the gneiss in accordance with the standard separation techniques[5]. The rock sample is crushed to pass through 80 mesh (ASTM) taking precautions to avoid fine crushing. This rock powder is washed and by panning the heavy concentrates are obtained. Magnetic fractions are then removed with a hand magnet and the concentrates are treated with dilute hydrochloric acid with a few drops of stannous chloride to remove the iron stains. It is further treated with bromoform (Sp-gr.2.9) to get rid of the lighter minerals. The fraction is fed to the Frantz Isodynamic magnetic separator (25°' forward tilt and 15° side tilt) to obtain a pure zircons from the non-magnetic fraction. Final treatment with clerici solution (Sp gr.4 2) gives the pure zircon concentrate. Further purification is done by handpicking.

Characteristics of zircons: The studied zircons are colourless to pinkish brown (Figure 1). Seventeen percent of the zircons are metamict with rounded, dark, euhedral crystals. Fifty nine percent of the zircons are euhedral with simple and complex pyramidal terminations. Thirty-two percent of the terminally rounded crystals have their long axis parallel to the c-axis. Nine percent of the zircon possesses overgrowths: the shell and core being either euhedral or with rounded terminations. A few crystals show zoning and a few are constricted at the middle indicating effects of corrosion. Rounded, globular, and rod-like inclusions are common.

Figure 1. Zircons from quartzo feldspathic gneiss, Kottayam district, Kerala.

Size-Frequency Studies: The length (L), breadth (B) and the elongation ratio frequency (L/B) curves are shown in figure 2. The length and breadth frequency curves are unimodal with a prominent peak at 0.125 mm and 0.025 mm respectively. The elongation ratio frequency curve is also unimodal with a sharp peak at 2.5.

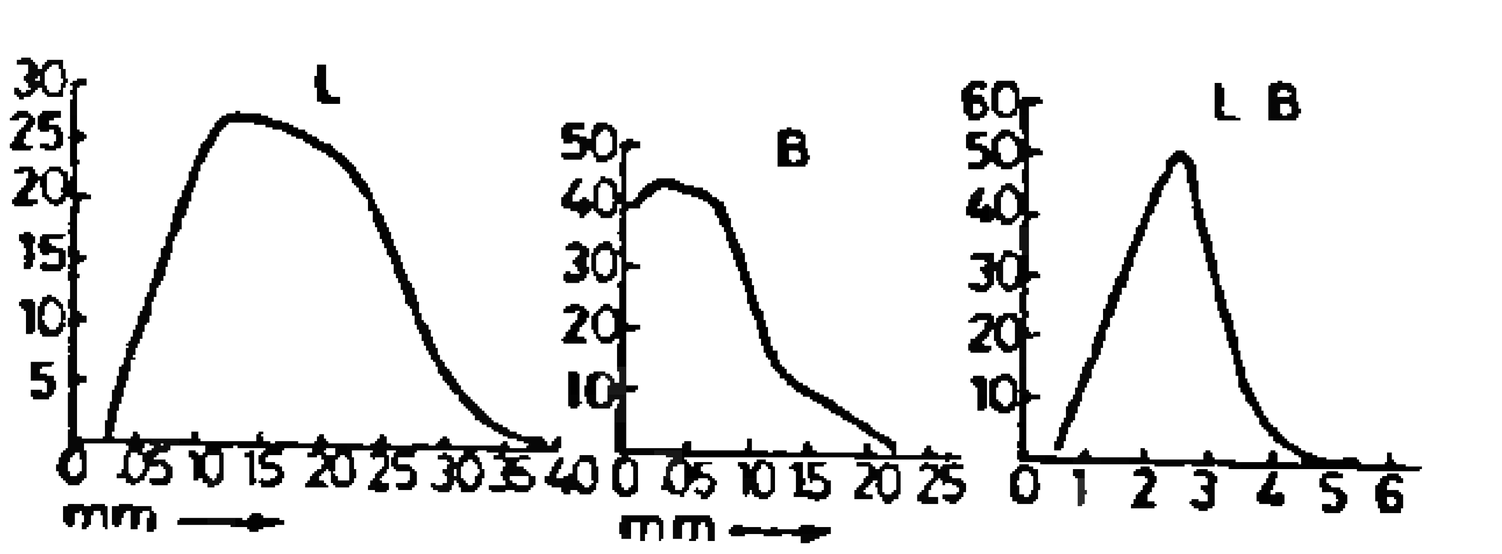

Figure 2. Size frequency curves for zircons from Mundakkayam, Kerala.

Reduced Major Axis: RMA is regarded as a growth trend pattern for the zircons in the gneiss and is shown in figure 3. The RMA when extended passes through the origin indicating that the zircons are self-nucleated[3,5,6]

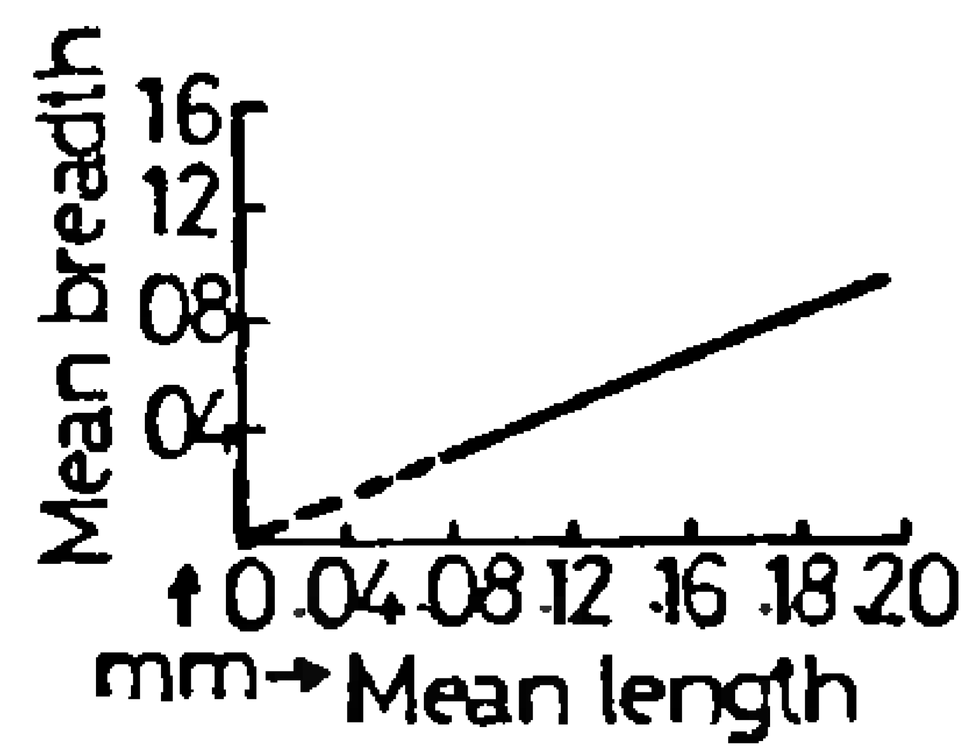

Figure 3. RMA for zircons in quartzo felspathic gneiss.

The zircons show a high percentage of euhedral crystals. These crystals are of one type with an unimodal peak in their elongation ratio-frequency curve, the prominent maxima being well above 2.0. Negligible percentage of overgrowths are noticed. The RMA suggests that the zircons are self-nucleated. Thus, the features, in general, are suggestive of magmatic origin of the gneiss studied.

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RARE RADIOACTIVE PERPOTASSIC ALKALI SYENITES FROM PARTS OF SOUTH SIKKIM, INDIA

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RADIOACTIVE syenite with high Nb content (ca. 250 ppm) was first reported by Roy and Gupta