Chapter 3
Major Intrusions

Classification

The granite of Chek Lap Kok is part of two much larger major intrusions of granite, the Chek Lap Kok Granite that extends to the west, and the Lantau Granite to the east of Chek Lap Kok. The definition of the rock is based on composition, after Le Maitre (1989) (Figure 5), and is the same as that used by Allen & Stephens (1971). Typical chemical analyses of the granite variants are given in Appendix 2.

On the map, the divisions based on grain size are not those adopted by Allen & Stephens (1971), but follow the engineering range of grain sizes in British Standards Institution (1981) as modified by Strange (1985). Where a megacrystic texture is a distinctive mappable feature of the granite, it is shown by an overprint on the map sheet.

The granite of Chek Lap Kok mostly varies from fine-grained to fine- to medium-grained, and locally includes a noticeably finer grained microgranite. All the varieties are characterized by an inequigranular groundmass, with a wide range of grain sizes seen in hand specimen and thin section. Where the rock is megacrystic, the size range of mineral species is clearly bimodal; a finer groundmass can be seen to contain coarser megacrysts. Megacrysts of alkali feldspar, which comprise tabular subhedral white crystals up to 20 mm long, are commonly seen; rarely they are up to 45 mm long. Rounded glassy grey quartz megacrysts are usually less than 10 mm, while single flakes of black shiny biotite may be up to 3 mm across; aggregates or clots of small biotite crystals are larger, often up to 5 mm.

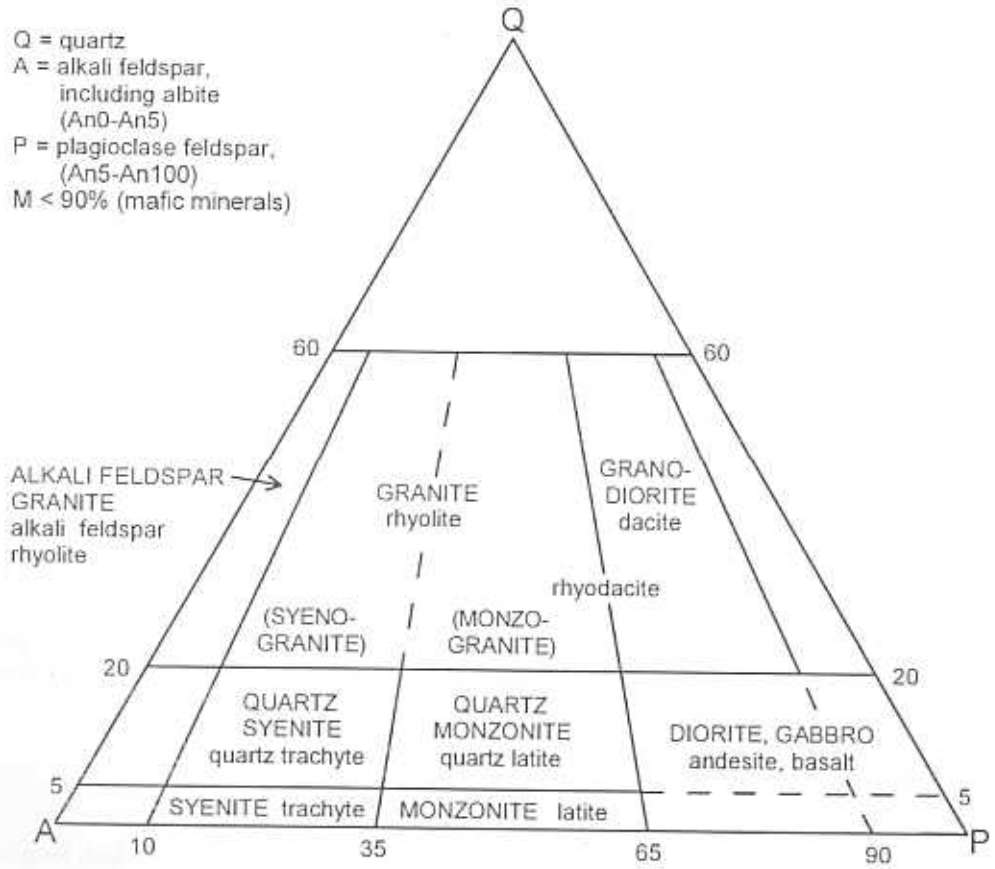

Figure 5 - General Classification and Nomenclature of Selected Major and Minor Intrusive Rocks (after Le Maitre, 1989)

Fine-grained Granite

Distribution and Lithology

The west of the island is dominantly composed of fine-grained granite, in part markedly megacrystic. The grain size of the groundmass typically lies between 0.5 and 2 mm. As such the granite lies in the upper size range for fine-grained granite (0.06 to 2 mm), and close to the medium-grain range (2 to 6 mm).

Details

Northwest Chek Lap Kok. Inequigranular non-megacrystic or sparsely megacrystic fine-grained granite outcrops west of a line from Sham Wan to Fu Tei Wan. The rock is light pinkish grey in coastal exposures, and grey when fresh. Quartz megacrysts, up to 5 mm, are only rarely seen. Single flakes of shiny biotite, mostly from 1 to 3 mm, are a prominent feature of the rock. The grain size of the groundmass is 0.2 to 2 mm, although mostly around 1 mm.

Sample HK8362 from Cheung Sha Lan (1101 1976) (Plate 2) is typical, displaying single biotite flakes up to 2 mm. The rock exposures here show signs of having been extracted for building stone, and are relatively free of joints. Sample HK8363 from the borrow area for the test embankment (1069 1905) (Plate 3) is a finer variety of the granite (microgranite), and is the rock type that dominates the borrow. Much of the construction material for the test embankment is fine-grained granite, but there are also blocks of fine- to medium-grained granite, and rarely of medium-grained granite.

Petrography

Sample HK8362 (1101 1967) (Plate 2), from Cheung Sha Lan, is a pinkish white inequigranular fine-grained granite with a groundmass typically between 0.5 and 1 mm. There are some alkali feldspar crystals up to 4 mm, and rare quartz megacrysts up to 5 mm. Biotite flakes are less than 2 mm across.

Fine-grained granite from a borehole east of the kaolin mine (HK10511, 1114 1904) has a grain size ranging up to 3 mm in thin section, although most grains are less than 1 mm. The rock is composed of quartz, sericitized oligoclase and perthitic alkali feldspar with albite rims. The plagioclase is zoned, with altered cores and margins probably composed of albite. There is also biotite, chlorite, muscovite, fluorite and opaque minerals in the groundmass. The biotite is olive green, pleochroic light brown to green, and is commonly associated with green chlorite. The muscovite and fluorite are also usually found in close association. Compared with the older fine- to medium-grained granite, this granite is geochemically depleted in Al_2O_3, Fe_2O_3, MgO and Sr, and enriched in K_2O, Rb, Y and Th. On an R1-R2 tectonic discrimination plot (Batchelor & Bowden, 1985) the fine-grained granite plots in the syn-collisional field, whereas the fine- to medium-grained granite plots in the post-orogenic field.

Microgranite from the borrow area east of the test embankment (HK8363, 1069 1905) in thin section has a grain size mostly less than 0.25 mm. This contrasts with typical fine-grained granite. The rock has a markedly inequigranular texture, consisting of quartz, sericitized oligoclase and perthitic alkali feldspar. The plagioclase may have some compositional zoning. Muscovite and fluorite occur as a minor component, together with some chlorite; there is no biotite. The microgranite has a distinctive chemistry (Appendix 2), with depletion in TiO_2, Fe_2O_3, K_2O, MgO, Al_2O_3, CaO, Sr, Zr and Th, and enrichment in Nb, Y , Rb, Na_2O and U relative to the fine- and fine- to medium-grained granite.

Age Relations

The fine-grained granite is younger than the fine- to medium-grained granite, and is part of the Chek Lap Kok Granite. Late stage fluids related to pluton emplacement resulted in kaolinization of the granite in restricted areas. Aplite dykes and pegmatite patches have an intimate association with the fine-grained granite. The rock is cut by quartzphyric rhyolite, basalt and lamprophyre dykes, but not by feldsparphyric rhyolite dykes that may pre-date the emplacement of this granite.

Fine- to Medium-grained Granite

Distribution and Lithology

The fine- to medium-grained granite is part of a separate intrusion, the Lantau Granite, which forms much of the east of the island. Remnants of this earlier intrusion are also found in the west and north, but intrusive relationships between this granite and the younger fine-grained granite can not be seen. Although there are small differences in mineralogy, the material characteristics of the rock are not markedly

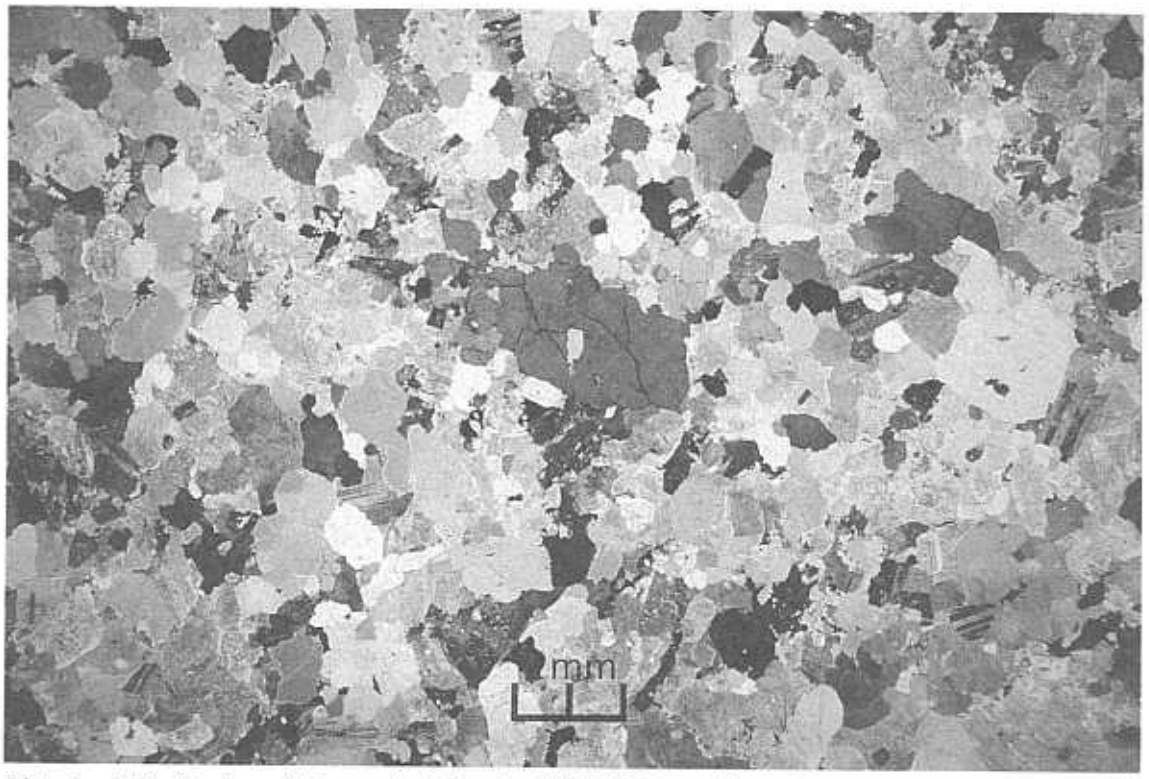

Plate 2 - Thin Section of Fine-grained Granite (HK8362) from Cheung Sha Lan (1101 1976); XPL plus 1/4-wave plate x 7

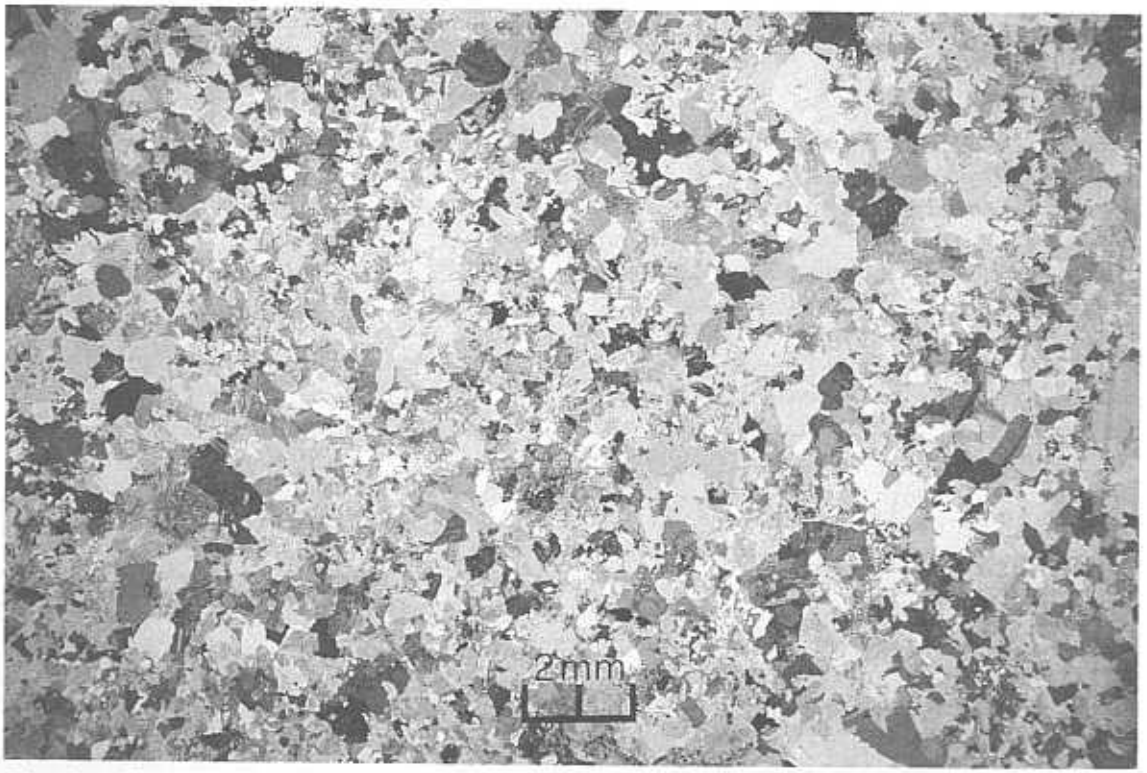

Plate 3 - Thin Section of Fine-grained Granite (HK8363) from near the Test Embankment, (1969 1905); XPL plus 1/4-wave plate x 7

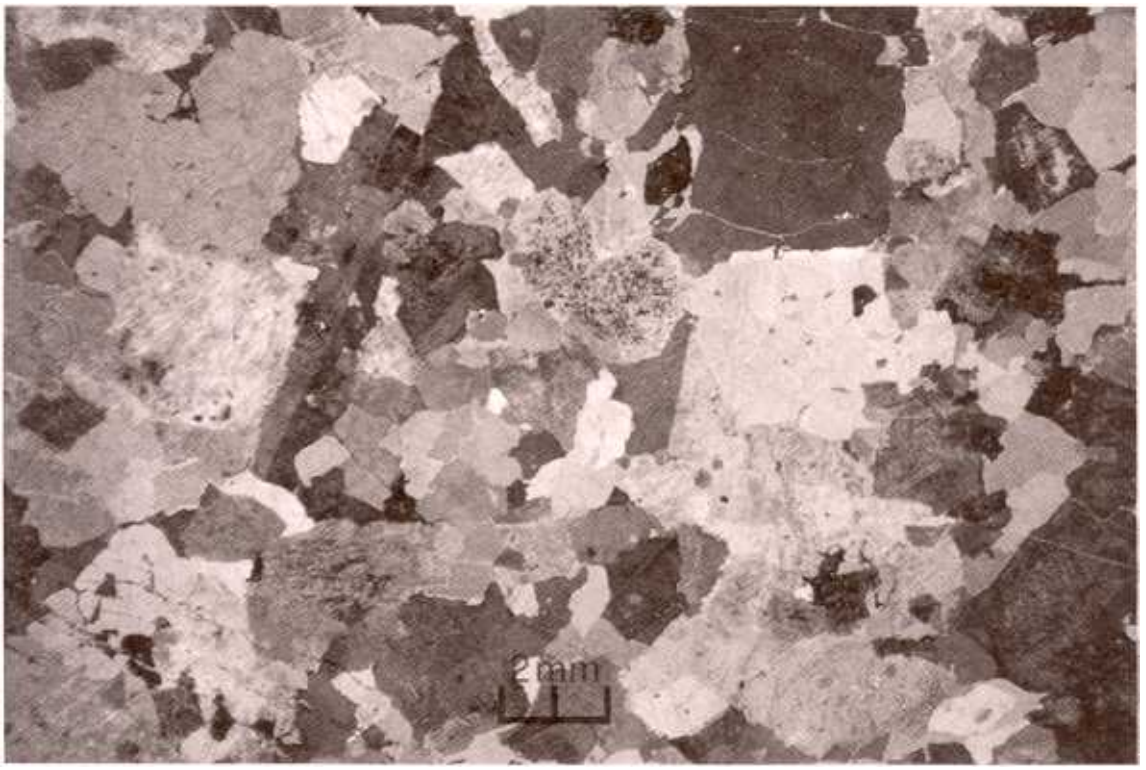

Plate 4 - Thin Section of Fine- to Medium-grained Granite (HK10518) from Pak Sha Tsui (11309 17165); XPL plus 1/4-wave plate x 7

different from the fine-grained granite, and both rocks weather in the same manner.

The granite is typically megacrystic, although this distinction is often difficult to make. Grain size typically varies from 1 to 4 mm, and in places the rock is slightly coarser (2 to 5 mm) and is truly medium-grained. Equigranular medium-grained granite has been seen in the rock forming the test embankment, and is exposed on the coast Northeast of Fui Yiu Wan (1220 1978).

Details

Northeast Chek Lap Kok. The coastal exposures and hills east of Fu Tan Shan, extending northnortheast to the tip of the island, are dominated by megacrystic fine- to medium-grained granite. To the west, the outcrop becomes progressively less megacrystic, but retains the inequigranular character.

The megacrystic fine- to medium-grained granite of this area is typically light grey, but may be pinkish in some coastal exposures. Feldspar megacrysts up to 10 mm long are commonplace, and they may be up to 45 mm. Quartz crystal aggregates up to 10 mm, and aggregates of biotite up to 7 mm or single flakes of biotite up to 4 mm make up the other megacrysts, set in a groundmass of around 0.5 to 3 mm. Sample HK9038 from northeast of Sham Wan (1221 1997) is a grey granite with feldspar megacrysts up to 10 mm and quartz up to 7 mm. Biotite occurs both as relict aggregates up to 5 mm and as single flakes up to 2 mm.

Southern Peninsula. The peninsula south of Ha Law Wan, terminating at Pak Sha Tsui, is composed of megacrystic fine- to medium-grained granite cut by quartzphyric rhyolite dykes. The rock is typically grey, comprising white feldspar, light grey glassy quartz and specks of biotite. Megacrysts of alkali feldspar up to 15 mm are common, in places forming a prominent feature of the rock. Quartz megacrysts are also sometimes prominent, and mostly form up to 5 mm.

Biotite typically occurs as single flakes up to 3 mm, and occasionally as aggregates of smaller crystals up to 5 mm. The groundmass, markedly inequigranular and often difficult to distinguish from the megacrysts, is around 0.5 to 3 mm. In the sample collected from borehole CL94/14357 near Pak Sha Tsui (HK10518, 11309 17165) most crystals are 1 to 3 mm, and the overall texture is fine- to medium-grained (Plate 4).

Petrography

In thin section, a sample of fine- to medium-grained granite from the south of the island (HK9236, 1131 1798) contains microperthitic alkali feldspar crystals or megacrysts from 2 to 4 mm. Plagioclase crystals, 1 to 4 mm across, have incipient sericitization and zoned extinction. Quartz, usually strained, is 1 to 2 mm, rarely up to 4 mm. Biotite is either pleochroic dark-light brown with green chlorite streaks, or is pale green and chloritized. The crystals are subhedral and about 2 mm in size. The texture is inequigranular, but not obviously megacrystic, with most crystals 1 to 4 mm across.

Megacrystic fine- to medium-grained granite from a borehole south of Ha Law Wan (HK10518, 1131 1716) has some quartz crystals up to 10 mm, but most crystals are around 2 mm (Plate 4). The groundmass is mostly composed of quartz, zoned and sericitized oligoclase and perthitic alkali feldspar. The biotite is typically chloritized, with some epidote, but when unaltered is green in colour, with pleochroism from light brown to green. The allanite in this sample is altered, although the presence of allanite is a significant distinction between this granite and the younger fine-grained granite.

Age Relations

The fine- to medium-grained granite is a textural variant similar to the Lantau Granite that outcrops on northeast Lantau. The granite probably cooled before the fine-grained granite of the Chek Lap Kok Granite. The fine- to medium-grained granite is cut by aplite, quartzphyric rhyolite, basalt and lamprophyre dykes. Feldsparphyric rhyolite dykes cut the granite in the south of the island, within an eastnortheast-trending belt dominated by the North Lantau Fault Zone (Figure 6).