Plate A3 - Typical appearance of fine alluvial sediment in jar samples. Tung Chung, Site 3; Drillcore CA-4A; Box 2, 43.4 – 46.95 m

Siltstone

Description

Moderately consolidated to semi-lithified sediment composed mainly of silt-grade particles (Plates 2 and 4a). Local intervals of intraformational conglomerate up to about 19 metres thick consist of siltstone fragments set in a moderately consolidated silty matrix (Plate 4b).

Key diagnostic features :

(i) Generally uniform, moderately consolidated to semi-lithified, silty sediment.
(ii) Typically blue-grey to olive green and brown; fracture surfaces are stained orange-brown to black.
(iii) Local intervals of colluvium.
(iv) No macroscopic shell, plant or fossil material.
(v) Little or no evidence of bedding or other sedimentary structures.
(vi) Found beneath the coarse alluvium/colluvium sequence and above 'basement' lithologies such as granite, rhyolite and metasedimentary rocks.

Comments

Two apparently separate occurrences of siltstone have been identified at Tung Chung, both in Site 4, where up to about 100 metres of siltstone has been cored locally.

Intervals of soft, pale green, very fine-grained material, sometimes with thin bands of grey silt, occur locally in the siltstone (Plate 5). The green material is typically flecked with streaks and spots of black Mn-oxide. A sequence of assorted boulders, cobbles, and occasionally marine sediments, is found at the base of the deepest occurrences of siltstone.

Reference sample no.: 36 & 23. Also in Reference drillcores B5 (27 – 60 m) and B-19 (32.5 – 130 m)

Plate A4a - Siltstone in a Tung Chung Mazier sample. Way-up is to the right. The orange-brown and black colouration is caused by precipitation of secondary Fe and Mn minerals on fracture surfaces. Tung Chung, Site 4; Drillcore B-33; Mazier sample, 61.5 – 62.5 m

Plate A4b - Typical appearance of intraformational conglomerate in the siltstone. Tung Chung, Site 4; Drillcore B-19; Box 4, 113.2 m

Plate A5 - Green very fine-grained material and siltstone in a Tung Chung Mazier sample. Tung Chung, Site 4; Drillcore B-19; Mazier sample, 98.0 – 99.0 m

Iron-rich rock

Description

Low density rock rich in iron oxide minerals, with abundant fine porosity.

Key diagnostic features :

(i) Dark brown to orange-brown colour.

(ii) Low density (i.e. noticeably light) in hand specimen.

(iii) Typically has a mottled appearance.

(iv) Close inspection reveals a honeycomb of small pore spaces with a siliceous-looking skeletal framework.

Comments

To date, this material has been found only in Site 3 where it forms intervals up to 2 metres thick in several drillcores.

Reference sample no. : 26, 27. Also in Reference drillcores CB46A (87.3 - 89.4 m) and CC9 (part of the interval 90 - 100 m).

Plate A6 - Typical appearance of iron-rich rock. Tung Chung, Site 3; Drillcore CB-46C; Box 2, 66.2 m

Marble

Description

Crystalline, fine- to coarse-grained, cream, blue-grey or dark grey rock consisting almost entirely of recrystallised calcite.

Key diagnostic features :

(i) Calcite marble fizzes strongly on contact with dilute hydrochloric acid (HC1).

(ii) Can be scratched by a steel knife.

(iii) Usually associated with other metasedimentary rocks, and locally with cavities and/or cavity-fill deposits.

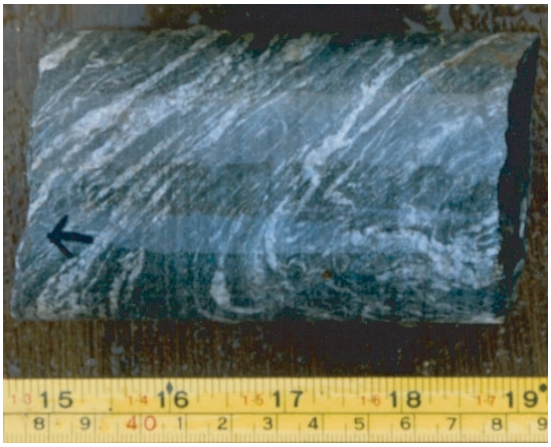
(iv) Weathered surfaces have a characteristic ‘pitted’ appearance.

Comments

Impure marble may contain enough siliceous material not to be scratched noticeably by a steel knife. The scratch test combined with the acid test is generally sufficient to identify and distinguish different types and purities of marble.

Care must be taken using the acid test, as siliceous metasedimentary rocks may contain a small proportion of carbonate minerals as thin sedimentary layers, as a cement, as secondary minerals or as hairline veinlets. The strong reaction of calcite with acid can lead to an overestimation of the proportion of carbonate in the rock. In Tung Chung drillcores essentially all the marble is composed of calcite (i.e. there is little or no dolomite marble), however the appearance of the marble varies locally. Marble is very rare in Site 3 drillcores, but where observed it is typically blue-grey. Marble is encountered in many Site 4 drillcores, where it is dark blue-grey to cream coloured and can be massive, banded and/or intensely calcite-veined (Plates 7a, 7c and 11b). Marble in Site 5 drillcores is cream to pale blue-grey and usually banded (Plate 7b).

Reference sample no.: 4, 16, 22, 35. Also in Reference drillcores D-34 (99.5 -105 m), E-75 (56 - 67. 5 m), C-26 (88 - 136) and C-42 (95 - 153).



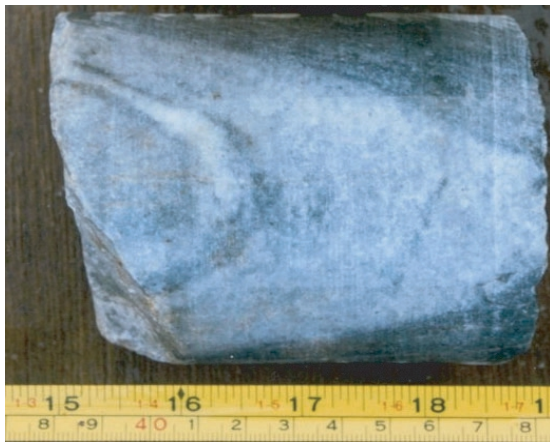


Plate A7a - Marble. The generally dark colour is typical of marble from this part of Site 4. See also Plate 11b. Tung Chung, Site 4; Drillcore C-42; Box 17, 145.9 m

Plate A7b - Marble from Site 5, showing the typical pale colour and banded appearance. Tung Chung, Site 5; Drillcore E-74; Box 11, 61.65 m

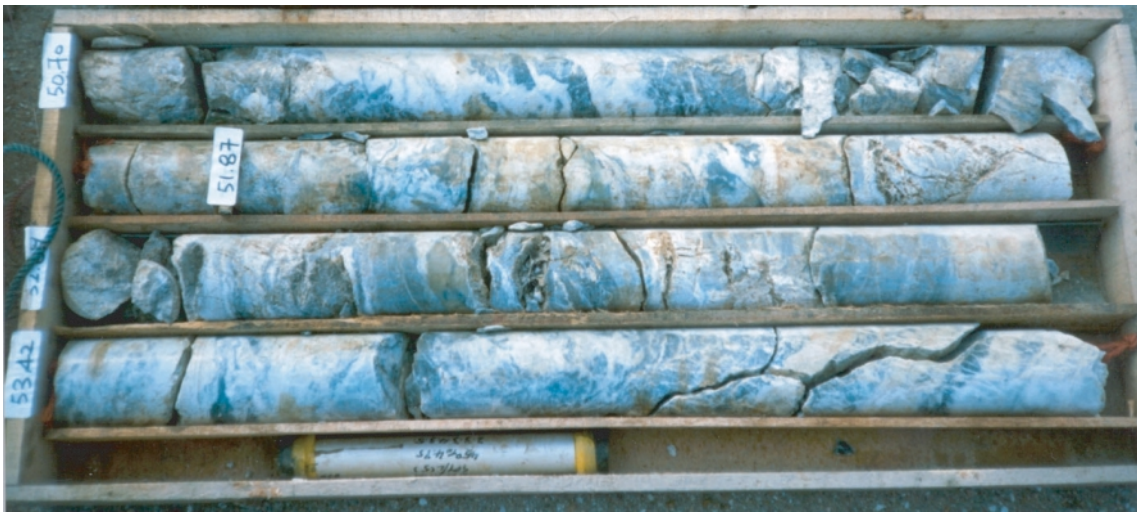


Plate A7c - Marble from Site 4. Note the textural heterogeneity and blue-grey to cream colour. Localised dissolution along calcite veinlets has developed into a small cavity at about 52.6 m. Tung Chung, Site 4; Drillcore A-19A; Box 2, 53.08 m

Calc-silicate rock

Description

Usually pale-coloured, often texturally heterogeneous rocks characterised by the presence of calcium-silicate minerals. The most diagnostic and most readily identifiable calcium-silicate minerals in Tung Chung drillcores are grossular (Ca-rich garnet, which typically forms round pink or purple crystals) and diopside (Ca-Mg-Fe pyroxene, which typically forms shapeless masses of dark green crystals).

Key diagnostic features :

(i) Presence of calcium-silicate minerals, in particular grossular and/or diopside; these minerals typically appear as irregular masses of pink or green crystals, respectively.

(ii) Virtually always associated with other types of metasedimentary rocks.

Comments

Calc-silicate rocks are metamorphosed shaly or quartz-bearing carbonate rocks or relatively pure carbonate rocks that have been metasomatized by siliceous solutions from contiguous granitic intrusions. They are a common component in skarn sequences (see Section 2.14).

Reference sample no.: Box 3 (117.5 - 121.5 m) from borehole BB-24; Reference drillcore C-6 (105 - 110 m).

Plate A8 - Calc-silicate rock. The pink mineral forming irregular crystal agglomerations is grossular garnet. The pale green mineral may be diopside. See also Plate 9. Tung Chung, Site 3; Drillcore BB-24; Box 3, 119 m

Quartzite

Description

Metamorphosed quartz sandstone. Variably coloured (but usually pale orange-brown, very pale purple, grey or creamy-white), massive crystalline rock composed of essentially pure quartz.

Key diagnostic features :

(i) Massive, crystalline.

(ii) Composed almost wholly of quartz.

(iii) Does not scratch or respond to the acid test.

Comments

Quite common in drillcores from Site 4, where it can be up to 10 metres thick but is usually around 0.5 - 2 metres. Much less common in Site 3 and virtually absent in Site 5 drillcores.

Reference sample no.: 17

Photograph: See Geoguide 3, Plate A1[AI]

Metasandstone

Description

Metamorphosed, generally fine- to medium-grained sedimentary rock dominated by silicate minerals such as quartz and feldspar, though it may have a small proportion of other (usually micaceous) material as dispersed grains or thin bands.

Key diagnostic features :

(i) Mid- to dark grey, siliceous (will not scratch easily).

(ii) Often has discernible banding.

(iii) Often associated with other metasedimentary rocks.

Comments

Distinguished from quartzite by the presence of minerals (mainly feldspar) other than quartz. Relatively rare in Tung Chung drillcores; occurs in relatively thin intervals.

Reference sample no.: No sample.

Metamudstone

Description

Metamorphosed sedimentary rock composed dominantly of micas, though some quartz and/or feldspar grains may be present.

Key diagnostic features :

(i) Dark grey or dark green-grey, fine-grained rock.

(ii) Often has discernible banding, although often poorly preserved.

(iii) Often associated with other metasedimentary rocks.

Comments

Care must be taken in distinguishing metamudstone from dark, fine-grained igneous rocks (see Sections 2.22 and 2.23). If the diagnostic features listed above are insufficient, the rock should be examined closely for phenocrysts (which may be present in the igneous rocks), and the hardness test should be applied (metamudstone will generally scratch more easily than igneous rock).

Reference sample no.: No sample.

Photograph: See Plate 9 and Geoguide 3, Plate A1[W}

Magnetite-rich rock

Description

Rock rich in magnetite.

Key diagnostic features :

(i) Generally black and dense (heavy) relative to silicate and carbonate rocks.

(ii) Usually occurs as thin bands in skarn sequences 9see Section 2.14).

(iii) Likely to be magnetic.

Comments

Very rare in Tung Chung drillcores; possibly confined to parts of Site 5.

Reference sample no.: 10

Skarn

Description

The term 'skarn' is generally used for rock composed of Ca-, Mg- and Fe-silicate minerals that has been derived from nearly pure limestone or dolomite into which large amounts of Si, A1, Fe and Mg have been introduced by the activity of fluids because of proximity to an igneous intrusion. At Tung Chung the term is used in a broader context, to describe complex sequences of differing types of thermally metamorphosed rocks (calc-silicate, metamudstone etc.) The term 'skarn' can also be used where the nature of the original metasedimentary rock cannot be determined due, for example, to overprinting (see Plate 10a).

Key diagnostic features :

(i) Sequence of lithologically variable metasedimentary rocks with mineralogical and/or textural features indicative of thermal metamorphism.

(ii) Usually banded and/or texturally heterogeneous. Banding can be highly convoluted.

(iii) Often associated with other metasedimentary rocks, such as quartzite and marble.

Comments

Irregular masses and veins of purple fluorite are associated occasionally with skarn.

Reference sample no.: 10, 24, 33, 34; also Reference drillcores D-34 (118 - 120.5 m) and BB-24 (117.5 - 121.5 m)

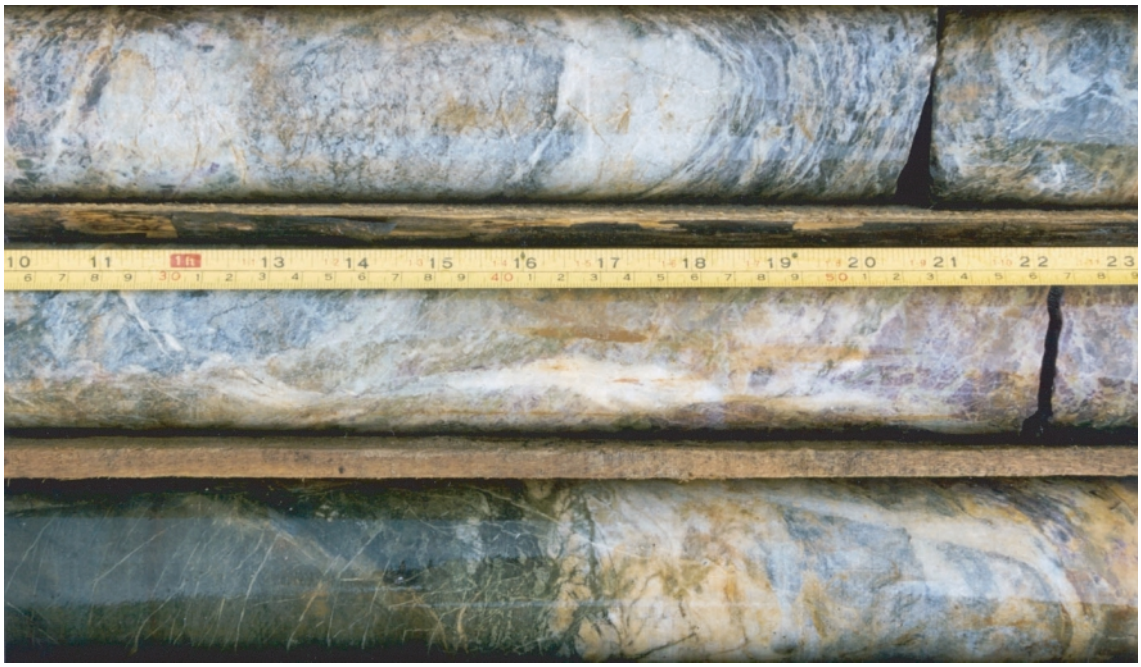


Plate A9 - Skarn from Site 3 showing typical textural and mineralogical heterogeneity. Note the purple fluorite. The dark green rock at bottom left is Metamudstone with faint banding. Most of the remaining skarn assemblage is calc-silicate rock. Tung Chung, Site 3; Drillcore CC-20; Box 7, 168 m

Plate A10a - Skarn. A pale green mineral or mineral assemblage (probably mainly epidote) has overprinted dark green ?metamudstone during thermal metamorphism. The white mineral is quartz, filling a sub-vertical vein. Tung Chung, Site 3; Drillcore BB-24; Box 4, 122 m

Plate A10b - Typical skarn from Site 3. Note the textural heterogeneity and banding. Tung Chung, Site 3; Drillcore CC-15; Box 7, 138.20 - 143.96 m

Cavity

Description

A void in the rock mass.

Key diagnostic features :

(i) In drillcores, cavities may be recognised by intervals of no recovery, usually in association with metasedimentary rock.

(ii) Cavities may be bounded by rock with a weathered or partly dissolved appearance.

(iii) Drillers logs may record a drop of the coring tool when a cavity is encountered.

Reference sample no. : No sample

Cavity fill deposit

Description

A sediment of rock fragments, sand, silt, Fe, Mn and clay minerals which partly or wholly fills a cavity. Cavity-fill deposits range from unconsolidated to consolidated/lithified.

Key diagnostic features :

(i) A sediment of unsorted rock fragments, sand, silt, Fe and/or Mn minerals and clay.

(ii) May be several tens of centimetres to several tens of metres thick.

(iii) Bedding or lamination may be discernible.

Comments

The nature of cavity-fill deposits is highly variable. In Sites 3 and 5, cavity-fill deposits are up to 2-3 metres thick and consist of sand to silt grade, orange to dark brown, unconsolidated sediment, with or without pebbles. Cavity-fill deposits in Site 4 are commonly much thicker (up to about 40 metres) and consist of semi-lithified 'breccias' of coarse to fine, angular rock fragments set in a dark grey, silty matrix, with local replacement and veining by gypsum.

The considerable thickness of many cavity-fill deposits, the lack of polished surfaces or slickensides, and occasional lamination in the matrix is generally sufficient to distinguish them from fault breccia.

Reference sample no. : 18; also in Reference drillcores D-28 (72 - 88 m), D-34 (105 -118 m), C-6 (discontinuously in the interval 95 - 160 m) and C-26 (discontinuously in the interval 115 - 134 m)

Plate A11a - Cavity-fill deposit. This sample is typical of the thick intervals of consolidated cavity-fill deposit encountered in parts of Site 4. Angular fragments of various lithologies are set in a silty matrix. Following formation of the deposit, some of the calcareous rock fragments have partly dissolved, creating pits and voids in the rock, and the deposit has been veined by white gypsum. Tung Chung, Site 4; Drillcore C-13; Box 6, 139.65 m

Plate A11b - Cavity-fill deposit and marble. Dark blue-grey marble with white calcite veins separated by intervals of weakly consolidated cavity-fill deposit. In this case the cavity-fill deposit is dark grey and contains assorted angular rock fragments set in a grey, silty matrix. The marble may be in situ, or it may represent large detached blocks in the cavity-fill. Tung Chung, Site 4; Drillcore C-20; Box 5, 89.3 - 94.0 m