

## (礦物部分共50分)

## 一、【解釋名詞，每題5分，共10分】

- (1) quartz (2) pseudomorphs

## 二、【簡答題，共20分】：下列是摘自礦物學課本對Talc礦物之描述性資料，請在詳細閱讀後按照題號簡單且完整得回答本題的10個小題。

TALC— $Mg_3Si_4O_{10}(OH)_2$ 

**Crystallography.** Triclinic;  $\bar{1}$ . Crystals rare. Usually tabular with rhombic or hexagonal outline. Foliated and in radiating foliated groups. When compact and massive, known as *steatite* or *soapstone*.

$C1; a = 5.29, b = 9.17, c = 9.46 \text{ \AA}; \alpha = 90^\circ 28', \beta = 98^\circ 41', \gamma = 90^\circ 5'; Z = 4. ds: 9.34(10), 4.66(9), 3.12(10), 2.48(7), 1.870(4).$

**Physical Properties.** *Cleavage* {001} perfect. Thin folia somewhat flexible but not elastic. Sectile. H 1 (will make a mark on cloth). G 2.7–2.8. *Luster* pearly to greasy. *Color* white, apple-green, gray, or silver-white; in soapstone often dark gray or green. Translucent. Greasy feel. *Optics:* (-);  $\alpha = 1.539, \beta = 1.589, \gamma = 1.589; 2V = 6^\circ - 30^\circ. Z = b, X \perp \{001\}; r > v.$

**Composition and Structure.** There is little variation in the chemical composition of most talc; pure talc contains MgO 31.7, SiO<sub>2</sub> 63.5, H<sub>2</sub>O 4.8%. Small amounts of Al or Ti may substitute for Si and Fe may replace some of the Mg which causes the color change from white to green. *Minnesotaitite*, Fe<sub>3</sub>Si<sub>4</sub>O<sub>10</sub>(OH)<sub>2</sub>, is common in low-grade metamorphic Precambrian iron deposits. *Minnesotaitite* has a modulated structure that is different from that of talc; it is probable that an almost complete solid solution exists between talc and *minnesotaitite*. The trioctahedral structure of talc is similar to that of dioctahedral pyrophyllite and consists of essentially neutral  $t-o-t$  layers held together by weak residual bonds.

**Diagnostic Features.** Characterized by its micaceous habit, cleavage, softness, and greasy feel.

**Occurrence.** Talc is a secondary mineral formed by the alteration of magnesium silicates, such as olivine, pyroxenes, and amphiboles, and may be found as pseudomorphs after these minerals. Characteristically in low-grade metamorphic rocks, where, in massive form, *soapstone*, it may make up nearly the entire rock mass. It may also occur as a prominent constituent in schistose rocks, as in the talc schist.

In the United States, many talc or soapstone quarries are located along the line of the Appalachian Mountains from Vermont to Georgia. The major producing states are Montana, North Carolina, Texas, and Vermont.

**Use.** Most of the talc and soapstone produced is used in powdered form as an ingredient in paint, ceramics, rubber, insecticides, roofing, paper, cosmetics, and foundry facings. The most familiar use is in talcum powder. Talc is also used as an ornamental material for carving small objects.

**Name.** The name *talc* is of ancient and doubtful origin, probably derived from the Arabic word, *talk*.

**Similar Species.** *Minnesotaitite*, Fe<sub>3</sub>Si<sub>4</sub>O<sub>10</sub>(OH)<sub>2</sub>, the Fe-rich equivalent of talc. Occurs in Precambrian iron-formations.

1. Talc的中文礦物名稱是什麼？是屬於哪一種矽氧四面體結構的矽酸岩類？
2. Talc通常很純，但化學式中很少量的Si與Mg也會分別被什麼元素取代？
3. Talc的結晶構造屬於哪一個晶系？哪一個晶族？哪一個空間群？唯一的對稱要素是什麼？
4. Talc的折射率最低是多少？晶體的透光度如何？
5. Talc具有什麼解理？硬度是多少？
6. Talc的比重是多少？以中文來說是什麼光澤？
7. Talc的一個晶胞中有多少個原子？一個晶胞的體積大約多大？
8. 緻密塊狀的talc被稱作什麼英文名稱？
9. Talc可能與哪種礦物形成幾乎完全固溶體？此礦物產自什麼時代的什麼地層？
10. Talc的名字是從哪種語言的哪個字而來的？

見背面

- 三、 Silicates造岩礦物的結晶構造，主要都是由一個個最基本的四面體單位組成，其中再穿插各種陰陽離子來達到電價平衡。(1)請繪圖說明此四面體構造的幾何形貌、總價數、與化學組成。【6分】 (2) 請繪圖說明主要silicate結晶構造的七大分類與名稱(即上述四面體的組合關係種類)，並各舉一個Bowen's reaction series中礦物的例子(如果沒有請寫「無」)。【14分】

(岩石部分共50分)

- 一、【解釋名詞，每題5分，共30分】：

(1) sandstone (2) schist (3) andesite (4) diagenesis (5) potential temperature  
(6) lithosphere

- 二、【簡答題，共20分】：

(1) 請比較(a)中洋脊(b)隱沒帶兩種板塊構造環境的岩漿成因。【10分】  
(2) 何謂區域變質作用 (regional metamorphism)? 【6分】  
(3) 請描述台灣大屯火山的主要岩石組成和成因。【4分】

試題隨卷繳回