台北市南港地區軟弱砂岩之特性研究

The characteristics study of the weak sandstone in Nankang area of Taipei city

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摘要

本研究工作以計量化的方式將台北盆地東側南港地區桂竹林層及石底層之軟弱砂岩從 (1)自然物理性質，(2)岩石組構，以及 (3)礦物成分等三方面，以簡單迴歸分析及多元迴歸分析，來探討其對軟弱砂岩的傳波速度、單軸壓縮強度及消散耐久性等工程性質的影響 。

在自然物理性質方面，本研究工作以 (1) 含水量，(2) 孔隙率，(3) 密度以及 (4) 比重等方面來探討其對軟弱砂岩傳波速度，單軸壓縮強度及消散耐久性的影響。在本研究中，隨著含水量的增高，軟弱砂岩之單軸壓縮強度有降低的趨勢。隨著孔隙率的增高，傳波速度、單軸壓縮強度及消散耐久性皆會隨之下降，呈現一負相關的趨勢。而軟弱砂岩的密度愈大，則軟弱砂岩之傳波速度、單軸壓縮強度及消散耐久性亦會增大，呈現一正相關的趨勢。在比重方面，則和此三種工程性質無明顯相關性。

在岩石組構方面，從 (1) 顆粒堆疊方式，(2) 顆粒間相互接觸型態以及(3)顆粒粒徑大小等三方面來探討其對軟弱砂岩傳波速度、單軸壓縮強度及消散耐久性的影響。在顆粒間相互接觸型態方面，直線型接觸型態佔全部接觸型態含量比愈高時，則傳波速度、單軸壓縮強度及消散耐久性皆會有降低的趨勢。若顆粒間以嵌合型接觸型態相接觸的含量比愈高，則此三項工程性質亦會有升高的趨勢。在顆粒粒徑大小方面，則顆粒粒徑愈大，則此三項工程性質愈小，呈現一負相關的趨勢。在顆粒堆疊方式中，堆疊密度和堆疊相鄰關係皆和此三項工程性質無明顯相關性。

在礦物成分方面，大部分軟弱砂岩樣品之礦物組成皆以石英爲主，平均含量在 50%左右，其次爲基質成分，平均含量在 30%左右 ，再其次爲岩屑，平均含量在 10%左右。從迴歸分析結果顯示，傳波速度、單軸壓縮強度及消散耐久性有隨著石英含量增加而減少，隨著基質含量及岩屑含量增加而增加的趨勢，但相關性並不明顯。因此，在本研究中，礦物成分並非影響軟弱砂岩之傳波速度、單軸壓縮強度及消散耐久性的主因。

關鍵詞：軟弱砂岩、迴歸分析、自然物理性質、岩石組構、礦物成分、工程性質

Abstract

The study use simple and multiple regression analysis to quantify the effective factors of rock characteristics in (1) physical properties, (2) textures, and (3) mineral composition.

These factors were combined to compare their relationship with wave velocity, uniaxial compression strength and slake durability of the weak sandstone in Kweichulin Formation and Shidi Formation at eastern Taipei Basin The physical properties in this study includes 4 items: (1)water content,(2)porosity, (3)density, and (4)specific gravity. The analysis results of study materials demonstrate that the wave velocity and the uniaxial compression strength will decrease when the water contents increase. When the porosity increase, the wave velocity, the uniaxial compression strength and the slake durability will decrease. When the density increase, the wave velocity, the uniaxial compression strength and the slake durability will increase. There seems no relationship between specific gravity with these engineering charac-teristics. The rock textures in this study includes 3 items: (1) grain packing, (2) grain contact, and (3) grain size. The results of regression analysis demonstrate that the wave velocity, the uniaxial compression strength and the slake dura-bility will decrease when the percentage of straight type of grain contact increase. When the percentage of concavo-convex type of grain contact increase,the wave velocity, the uniaxial compression strength and the slake durability will increase. The results also demonstrate that these engineering characris-tics will increase when the grain size decrease. There seems no relationship between grain packing with these eingineering characteristics. The minerals composition of this study mainly include quartz, matrix and rock fragment. Quartz content is about 50% in average, matrix content is about 30%, and rock fragment content is about 10%. The results of regression analysisdemonstarte that the wave velocity, the uniaxial compression strength and the slake durability will decrease when the quartz content increase. These results of engineering characteristics also will increase by following the matrix and the rock fragment content increase. But the relationships are not clear in the characteristics comparison. Therefore, the minerals compositioin are not major effect factor to the wave velocity, the uniaxial compression strength and the slake durability in the weak sandstone of this study.

Key words: weak sandstone, regression analysis, physical properties, rock texture, minerals composition, engineering characteristcis