

Babouchite Siliceous Rocks: Mineralogical and Geochemical Characterization

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Abstract : The present work aims to determine mineralogical and geochemical characteristics of siliceous rock levels and to clarify the origin through geochemical arguments. This study was performed on the deposit of Tabarka-Babouch, which belongs to the northwestern of Tunisia; they spread out the later Miocene. Investigations were carried out to study mineralogical structure by XRD and chemical analysis by ICP-AES. The X-ray diffraction (XRD) patterns of the powdered natural rocks show that the Babouchite is composed mainly of quartz and clay minerals (smectite, illite, and kaolinite). Siliceous rocks contain quartz as a major silica mineral, which is characterized by two broad reflections at the vicinity of 4.26Å and 3.34 Å, respectively, with a total lack of opal-CT. That confirms that these siliceous rocks are quartz-rich (can reach 90%). Indeed, the amounts of all clay minerals (ACM), constituted essentially by smectite marked by a close association with illite and kaolinite, are relatively high, where their percentages vary from 7 to 46%. Chemical analyses show that the major oxide contents are consistent with mineralogical observations. It reveals that the siliceous rocks of the Babouchite formation are rich in SiO₂. The data of whole-rock chemical analyses indicate that the SiO₂ content is generally in the range 73-91 wt.%; (average: 80.43 wt.%). The concentration of Al₂O₃, which represent the detrital fractions in the studied samples, varies from 3.99 to 10.55 wt. % and Fe₂O₃ from 0.73 to 4.41wt. %. The low levels recorded in CaO (%) show that the carbonate is considered impurities. However, these rocks contain a low amount of some others oxides, such as the following: Na₂O, MgO, K₂O, and TiO₂. The trace elemental distributions also vary with high Sr (up to 84.55 ppm), Cu (5-127 ppm), and Zn (up to 124 ppm), with a relatively lower concentration of Co (2.43-25.54 ppm), Cr (10-61 ppm) and Pb (8-22ppm). The Babouchite siliceous rocks of northwestern of Tunisia have generally high Al/ (Al+Fe+Mn) values (0.63-0.83). The majority of Al/ (Al+Fe+Mn) values are nearly of 0.6, which is the biogenic end-member. Thus, Al/ (Al+Fe+Mn) values revealed the biogenic origin of silica.

Keywords : siliceous rocks, Babouchite formation, XRD, chemical analysis, biogenic silica, Northwestern of Tunisia

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