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A comparative study on the field density and moisture count of soil evaluated by nuclear density gauge and theoretical computations

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Nuclear density gauge testing is the most versatile testing method to measure the wet density and moisture content of soil and granular construction materials. It is widely being used for civil construction, mining, petroleum industry and archeology purposes. Nuclear density gauge testing is the most versatile non-destructive method to measure the experimental wet density and moisture content of soils and granular construction materials. The objective of this study was to compare the experimental moisture content and wet density of soil using the nuclear density gauge testing with the theoretical moisture content and wet density of the corresponding soils respectively. An extensive database containing 234 records of experimental moisture content and wet density of soil was utilized in this study. They were measured at six probe depths of thirty different holes at three different locations was utilized. The results showed that a very good relationship was existed between the experimental and theoretical moisture content and wet density of soils. Additionally, the moisture content and wet density of soils were shown to be proportional to the moisture count and density count of the corresponding soils respectively. A detailed statistical analysis was conducted to support the findings.

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Micro-Thermometric, Raman spectrometry and bulk Crush-Leach investigation of fluid inclusions in fluorite of Jebel Oust (Zaghouan district, north-eastern Tunisia)

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The Jebel Oust F-Cu deposit in northeastern Tunisia is hosted in Jurassic carbonate. F-Cu mineralization occurs as: (i) Within calcite veinlets; (ii) tectonic brechia at lower Liassic and Upper Jurassic contact and (iii) fractures filling. Fluorite with different habitus occurs as: (i) Large colorless crystals within veinlets crosscutting lower Liassic limestone; (ii) Massive colorless within calcite veinlets crosscutting lower Liassic limestone and upper Jurassic marlstone and (iii) white crystals at lower Liassic and upper Jurassic. Micro-thermometric and Raman bulk Crush-Leach investigation were performed on massive colorless fluorite. Three petrographic types of fluid inclusions have been recognized: Liquid-vapor-solid type (FIAA); liquid-vapor type (FIAB) and vapor type (FIAC). FIAA primary inclusions have homogenization temperatures ranging from 146 to 299°C with a mode 251°C, final melting NaCl temperature range from 246 to 279°C, corresponding to salinities of 34 to 36 wt % NaCl equiv. FIAB primary and pseudo-secondary inclusions have homogenization temperatures ranging from 102 to 196°C and salinities between 3 to 15 wt% NaCl equiv. FIAC inclusions have salinities around 3 wt % NaCl equiv. The semi-quantitative Raman analyses confirmed the presence of water (band stretching at 4120-4180 cm^{-}) and different amounts of CO_2 (band stretching at 1250-1400 cm^{-1}). Bulk crush leach analyses show that the solute compositions (Molar ratio Cl/Br= 655) of the fluids trapped in the inclusions hosted in fluorite ratio are consistent with an evaporated seawater origin. Microthermometric, Raman and Crush-Leach fluorite from Jebel Oust have demonstrated represent the involvement of a mixture of halite dissolution water and evaporated seawater component, these results are compatible with Mississippi-Valley- type mineralization and in accordance with the results of (Bouhlel et al., 1988) (Souissi et al., 1996) (30, 5 à 34 Wt% NaCl equiv) and Bouabdellah et al., 2013) at Jebel Tirremi (44, 2 Wt% NaCl+ KCl equiv) at temperatures up to 218°C.

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