



Determination of total carbonates in soil archaeometry using a new pressure method with temperature compensation

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For the determination of total carbonates in soil archaeometry a new technique was applied using a multi-sensor philosophy, which combines simultaneous measurement of pressure and temperature. This technology is innovative and complies with EN ISO 10693:2013, ASTM D4373-02(2007) and Soil Science Society of America standard test methods for calcium carbonate content in soils and sediments. The total carbonates analysis is based on a pressure method that utilizes the FOGII Digital Soil CalcimeterTM, which is a portable apparatus. The total carbonate content determined by treating a 1.000 g (+/- 0.001 g) dried sample specimens with 6N hydrochloric acid (HCL) reagent grade, in an enclosed reaction vessel. Carbon dioxide gas evolved during the reaction between the acid and carbonate fraction of the specimen, was measured by the resulting pressure generated, taking in account the temperature conditions during the reaction. Prior to analysis the procedure was validated with Sand/Soil mixtures from BIPEA proficiency testing program with soils of different origins. For applying this new method in archaeometry a total number of ten samples were used from various rocks which are related with cultural constructions and implements in Greece. They represent a large range of periods since the Neolithic times, and were selected because there was an uncertainty about their accurate mineralogical composition especially regarding the presence of carbonate minerals. The results were compared to the results from ELTRA CS580 inorganic carbon analyzer using an infrared cell. The determination of total carbonates for 10 samples from different ancient sites indicated a very good correlation ($R^2 > 0.97$) between the pressure method with temperature compensation and the infrared method. The proposed method is quickly and accurate in archaeometry and can replace easily other techniques for total carbonates testing. The FOGII Digital Soil CalcimeterTM is portable and easily can be carried for field work in archaeology.