



Calcium carbonate cementation of unconsolidated materials - An experimental approach

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Precipitation of calcium carbonates may cause significant changes in the porosity, permeability and overall physical properties of sedimentary rocks. In man made environments, carbonate cementation process may be desired to consolidate foundation soils and to stabilise embankments. On the other hand, chemical clogging by calcium carbonate may adversely affect the performance of wells and tunnel drainages.

The individual structure and composition of the carbonate cements provides information about the environmental conditions during the formation and secondary alteration. Thus, chemical and isotopic composition as well as microstructure of carbonate cements can be used as an archive for the reconstruction and to tailor the cementation progress. In the present study experiments were carried out to investigate carbonate cementation of primary unconsolidated material. The overall aim is to improve the understanding of the temporal evolution and spatial distribution of chemical precipitation within the pore space. Therefore, a CaCl_2 and a NaHCO_3 containing solution are pumped through a mixing unit and immediately thereafter through a column packed with solids of distinct grain sizes. The physicochemical conditions are adjusted by the flow rates and the individual composition of the input solutions. The addition of Magnesium ions as well as traces of Strontium and Manganese in the CaCl_2 solution is used to adjust precipitation kinetics and to provide proxies to gain insight into the precipitation conditions during cementation.