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DMSO Disaggregation of Sandstones Impels a Re-evaluation of Sandstone Diagenesis

Many hard sandstones (70% of 130 tested), with up to 30% authigenic quartz or calcite, collapse into loose sand when treated with warm (708C) dimethyl sulfoxide (DMSO). This requires a re-definition of ‘cement’ because in such cases secondary quartz and calcite are not binding agents, even when abundant. Disaggregtion time ranges from overnight to a few weeks. Spatial variation in disaggregation occurs on all scales, sometimes for no apparent reason. DMSO disaggregates sandstones by expanding and disrupting kaolinite; it has no effect on other minerals and kaolinite is always a major component of decanted fine fractions. The role of kaolinite as a binding agent is unclear, particularly in terms of the mode and timing of precipitation as well as how it could prevent bonding between quartz and calcite grains. We identified three kinds of kaolinite: authigenic coarse (vermicular), authigenic fine (~1µm), and detrital. Recovered authigenic kaolinite is often 5-10 wt.%, much more than commonly reported from thin sections. Mapping the distribution of C, O, Al, Si, and K appears the best way to analyze the distribution of fine clays because those finer than ~1µm are invisible in thin section. Testing of many more sandstones will be necessary to determine the frequency and distribution of DMSO disaggregation as well as why some sandstones disaggregate while others do not. This will result in new ways to examine sandstones and a new view of sandstone diagenesis. DMSO disaggregation is useful for removing fossils from sandstone matrices and may have applications to petroleum production.