coatings

Supplementary Materials: Application of SiON Coatings in Sandstone Artifacts Conservation

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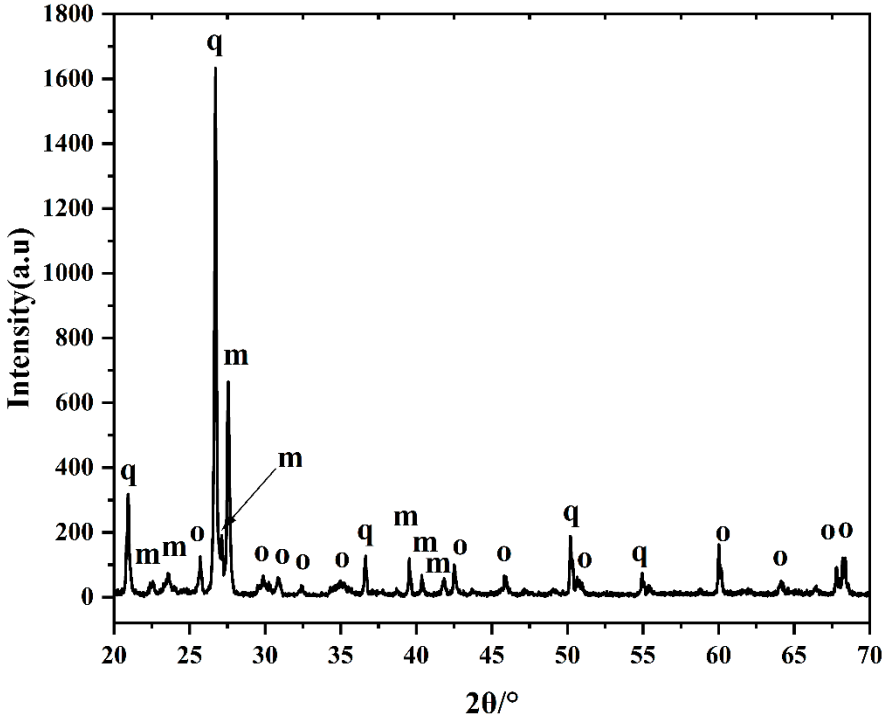

Figure S1. X-ray diffraction (XRD) spectra of pure sandstone: q=quartz; o=orthoclase; m=microcline.

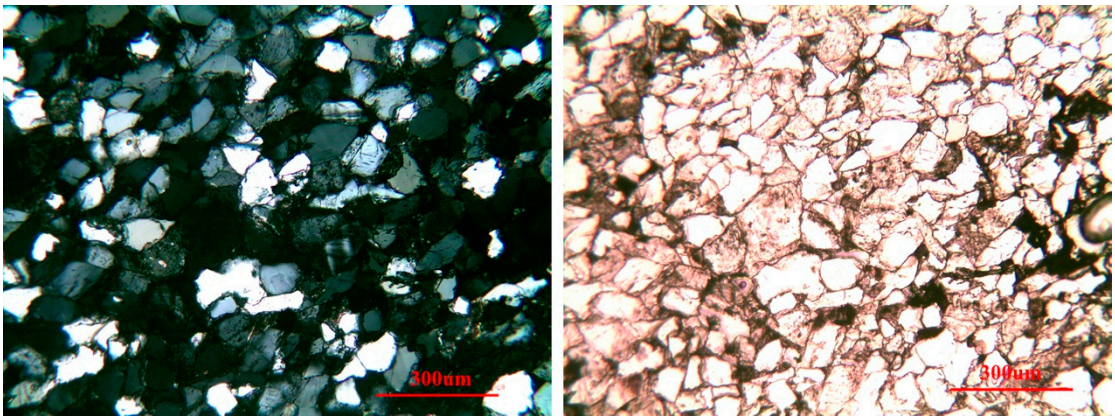

Figure S2. Photographs of sandstone flakes under orthogonal polarization (left) and single polarization (right).

Table S1. Microscopic analysis of sandstone minerals.

Minerals	Mineral characteristics under the microscope	Content (%)
Detrital minerals	The shape of the detrital minerals is sub-angular to sub-circular, with a particle size of 0.06-0.25 mm, mainly composed of quartz and feldspar, among which the feldspar is mainly alkaline feldspar, and plagioclase is occasionally seen. (1) Single-crystal quartz has a visible wave extinction. Affected by metamorphism, part of the quartz is recrystallized. (2) Alkaline feldspar showed varying degrees of kaolinization and weak sericitization. The plagioclase with polycrystalline twins showed varying degrees of kaolinization and sericitization. (3) The rock fragments include clayey siliceous rock, siliceous rock, and muscovite debris.	(1) Feldspar：25-30%; (2) quartz: 50-60%; (3) cuttings: 20–25%.
Filler content	The interstitial fillings are clay (matrix), ferruginous cement, and siliceous cement. (1) The clay has turned into sheet-like sericite, with a sheet diameter of 0.005-0.01mm; (2) The distribution of cryptocrystalline ferruginous cement filling the gaps makes the rock slightly earthy in tone; (3) Siliceous cements have changed to quartz, resulting in larger quartz particles.	(1) Kaolin: few; (2) ferruginous cement:1-2%;(3) Siliceous cements: 1-2%.
Auxiliary mineral	Magnetite，zirconite	——
Secondary minerals	Kaolin, sericite	——
In summary, the rock structure is sandy and the structure is blocky. The metamorphic process of the sandstone is roughly as follows: the original rock is fine-grained clastic feldspathic sandstone; regional metamorphism; weak mineralization.		

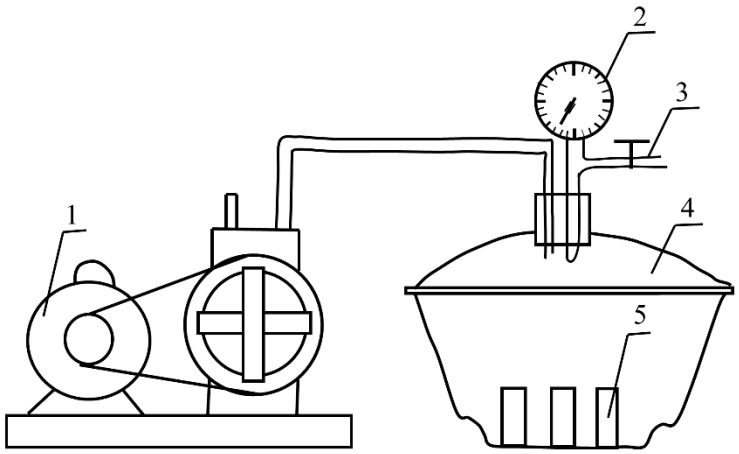

Figure S3. Diagram of vacuum device: (1) Vacuum pump, (2) Vacuum pressure gauge, (3) Water inlet, (4) Vacuum pumping tank, and (5) Samples

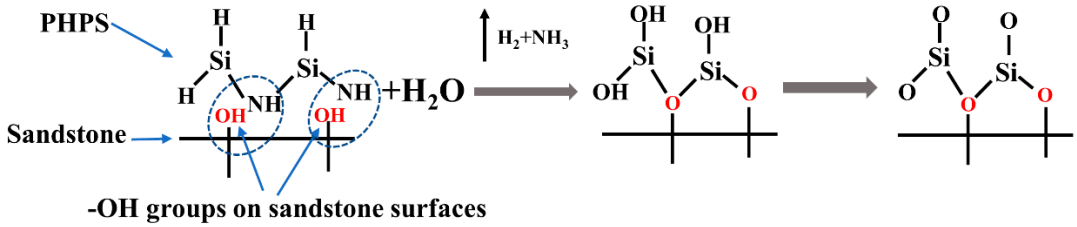

Figure S4. The binding mechanism between PHPS and the hydroxyl groups of the sandstone substrate is depicted in a simplified manner.

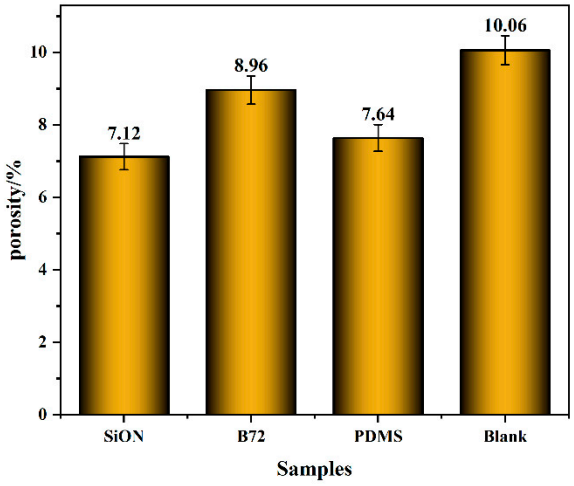

Figure S5. Porosity of sandstone before and after coating with different materials.

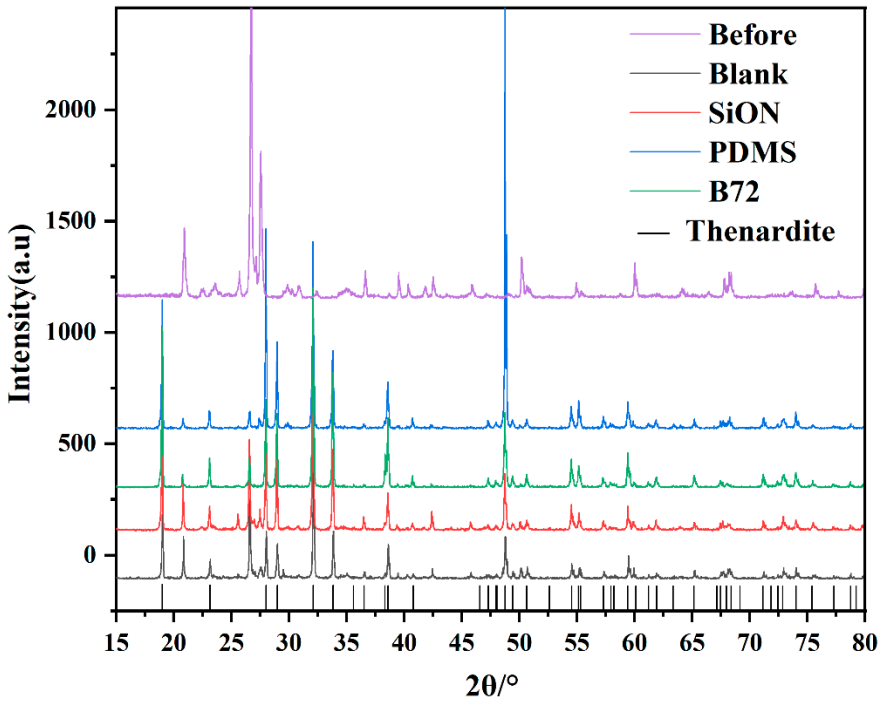

Figure S6. XRD analysis of sandstone surface particles before and after salt weathering experiments.

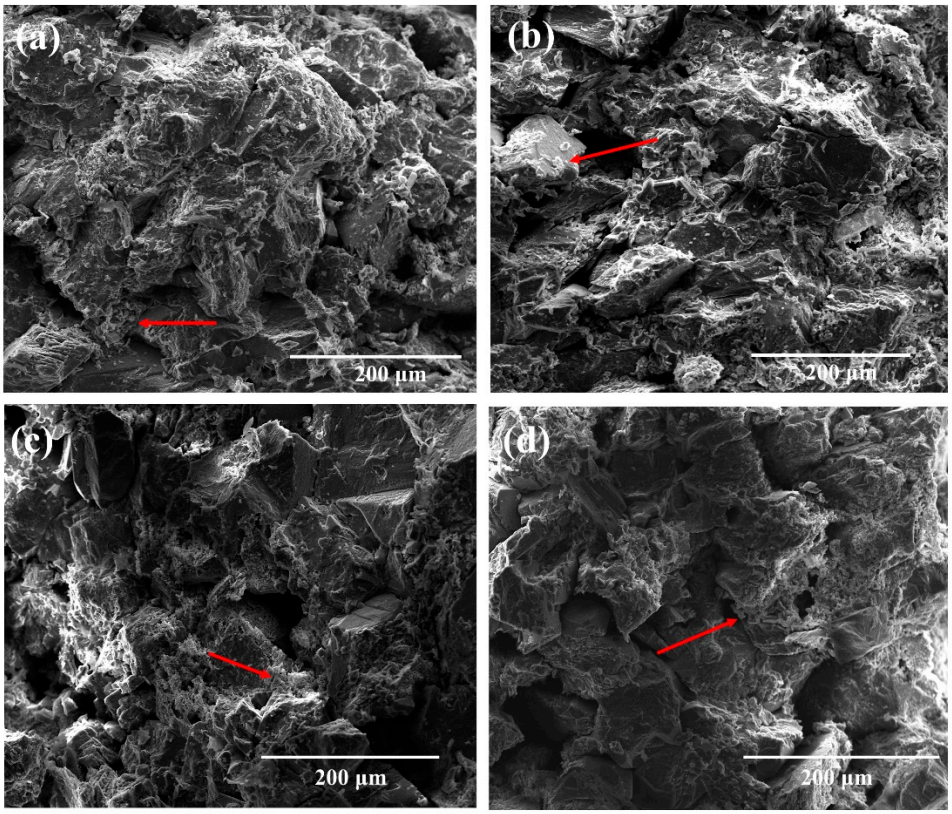

Figure S7. Distribution of thenardite within the sandstone (near the surface): (a) sample SiON, (b) sample B72, (c) sample PDMS, and (d) sample Blank.

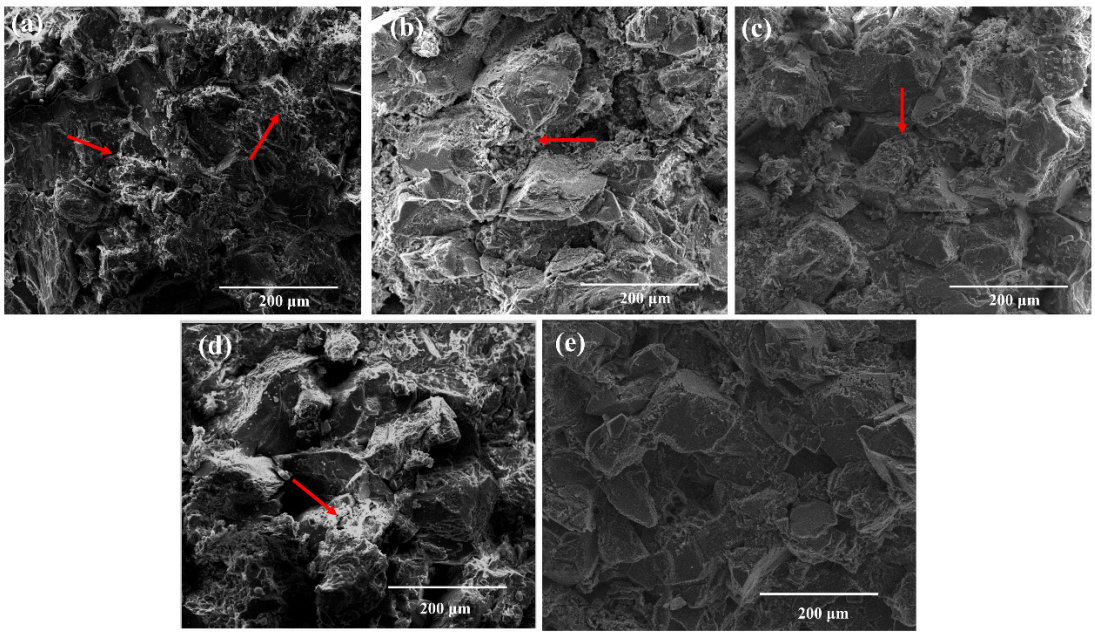

Figure S8. Distribution of thenardite within the sandstone (1 cm from the surface): (a) sample SiON, (b) sample B72, (c) sample PDMS, (d) sample Blank, (e) sample Blank before salt weathering.