European Space Agency

# European Space Agency Exploration Sample Analogue Collection [ESA²C]

## ESA02-A

## Attapulgite Granules

**Source:** Senegal

**Supplier:** Macromin Kentish Minerals (UK)

**Initial mass:** 150kg

**Sample Description:**
Pale cream slightly gravelly silty angular to rounded well graded sand. Silt, sand and fine gravel is attapulgite clay.

**MATERIAL AVAILABLE FOR LOAN**

**Polished Blocks:** 5 X 25mm
**Primary Granules:** up to 100g
**Milled powder (<1µm):** 50g

### Chemical and Mineralogical Properties

| Analysis | Results |
|---|---|
| **Minerals Present** | palygorskite-sepiolite group,smectite. Accessory (<10wt.%): Ca-plagioclase, quartz, dolomite<br>d-spacing: 10.8 A (air) 10.9 A (EG solvation) |
| **Chemical bonding fingerprint** | Main peaks (wavenumber $cm^{-1}$): 3681.5, 3500, 1595, 1189, 1078, 926, 899, 855, 772, 632 |
| **Bulk Trace Chemistry** | Results outstanding |
| **Additional Analyses** | ICP-MS* ICP-AES * |

### Physical and Mechanical Properties

| Analysis | Results |
|---|---|
| **Particle Size Distribution** | $D_{10}$: 0.55mm; $D_{50}$: 2.19mm;<br>$D_{90}$: 4.95mm<br>Mean fines passing 63µm sieve: 2.19% |
| **Grain Morphology** | Angular to rounded. Smooth. Ranges from low to high sphericity |
| **Bulk Density** | 770 $kg/m^3$ (loose)<br>890 $kg/m^3$ (compacted) |
| **Porosity** | 71.3% (loose)<br>66.5 % (compacted) |
| **Shear Strength** | Cohesion: 9.1 kPa<br>Angle of internal friction: 29.7° |
| **Additional Analyses** | Micro-CT* |

***NHM**: Analyses performed at/for the NHM, results available on request
****EXT**: Analyses performed by other researchers. Unverified results available on request

NATURAL HISTORY MUSEUM

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