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Extracting Silica from Lunar and Martian Regolith for Complex Materials and Systems Development

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Powdery soil (regolith) abundant on Lunar and Martian surface is one of the most promising materials for In-Situ Resource Utilization

Lunar regolith consists of 47.3 % of SiO_2

Papike J.J., Simon S.B., and Laul J.C. (1982) The lunar regolith: chemistry, mineralogy and petrology, Rev. Geophys. Space Phys., 20, pp. 761-826.

Martian regolith consists of 40 % of SiO_2

<https://photojournal.jpl.nasa.gov/jpeg/PIA16572.jpg>

Silica is an amorphous type of SiO_2 that is used in various applications



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Ceramic materials

- Glass
- Aerogels
- Composites
- Fibers
- Concrete

Reinforcing additive

- Polymer composites
- Coatings

Agriculture

- Fertilizer / carrier
- Hydroponic soil
- Water filter

Silica

Various morphology & surface properties

Insulation

- Thermal
- Acoustic
- Electric

Kinetic energy absorption

- Dust impact
- Shock absorption

Chemical processes

- Adsorber
- Silicone production
- Catalyst support



Silica extraction from SiO₂

Lunar/Martian regolith

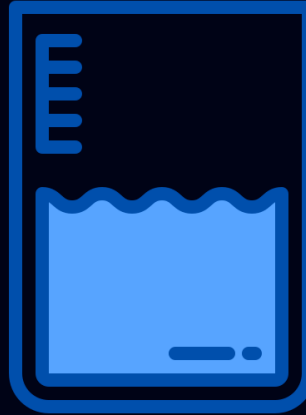


Dissolving SiO₂ + filtration



Water + strong base

Waterglass solution

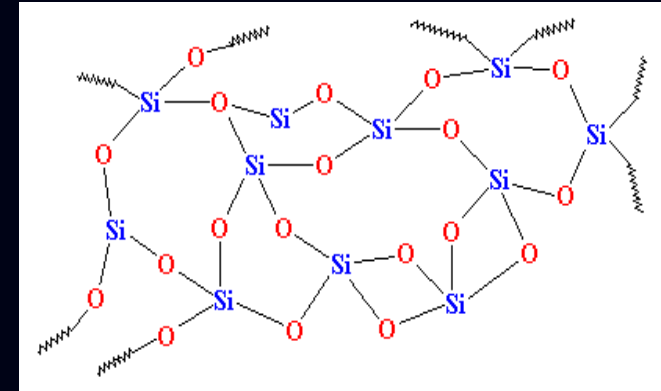


Precipitation

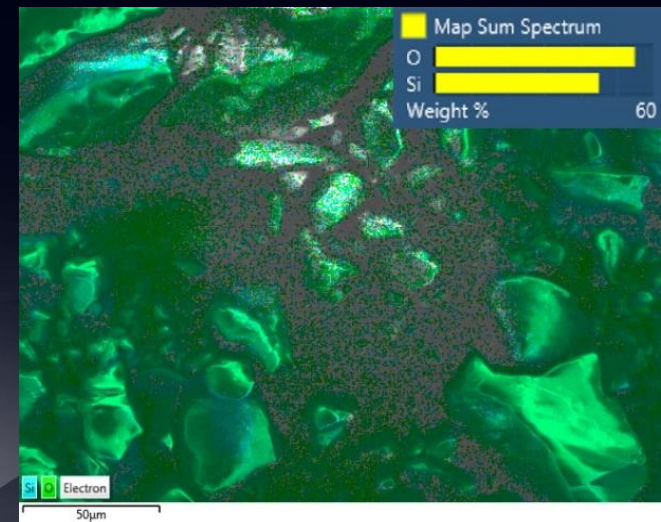
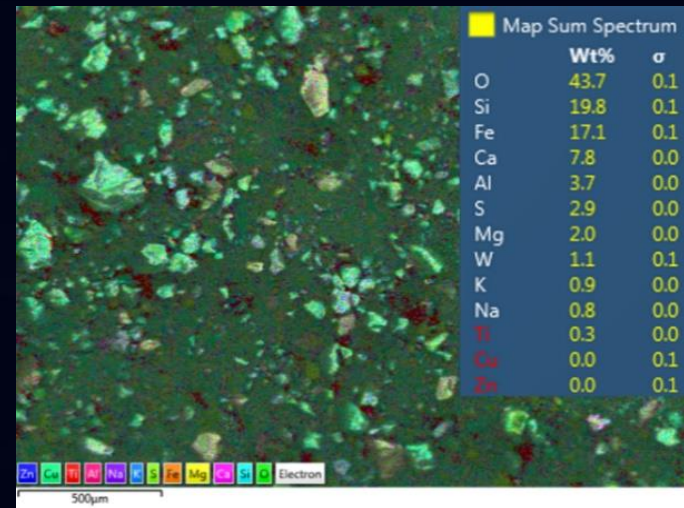


Acid

Amorphous silica



First silica successfully produced



<https://pslc.ws/macrog/glass.htm>

https://www.flaticon.com/free-icon/beaker_3030093

<http://www.space-systems.eu/index.php/en/the-institute/research-labs/lunar-lab>



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Thank you for your kind attention!

