

Synthesis of High Purity Sodium Silicate Material from Clay Industry Waste Silica



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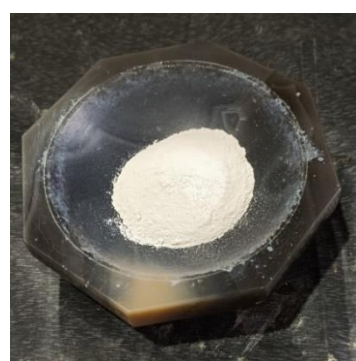


INTRODUCTION & AIM

Silica is one of the major wastes produced as a result of mining in the clay industries. With the goal of turning industrial waste into valuable chemical materials, this project investigates the sustainable synthesis of sodium silicate from silica-rich waste produced by the clay industry. This technique shows a practical, environmentally responsible way to value the waste from the clay industry while supporting resource recovery and circular economy principles. The study shows how to turn industrial waste into a highly sought-after chemical product in an efficient and environmentally responsible manner.

METHOD

The light mineral silica sand is used for the experimental analysis. The sample is crushed into a fine powder using an agate mortar. The powdered sample is weighed and it is mixed with premeasured amount of sodium hydroxide and potassium hydroxide and roasted in a furnace. The roasted sample is leached and filtrate is concentrated to get a white solid mass get precipitated in the filtrate. It is then removed and placed back in the tubular furnace and heated. A white powdery material is obtained and then tested.



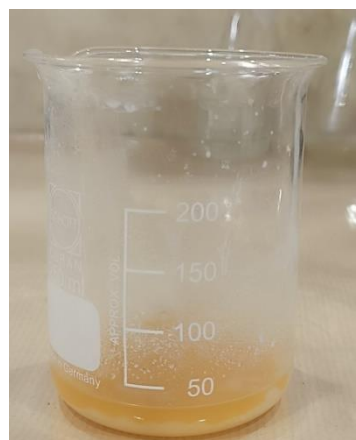
Crushed sample



Roasted sample



Leaching



Concentrated filtrate



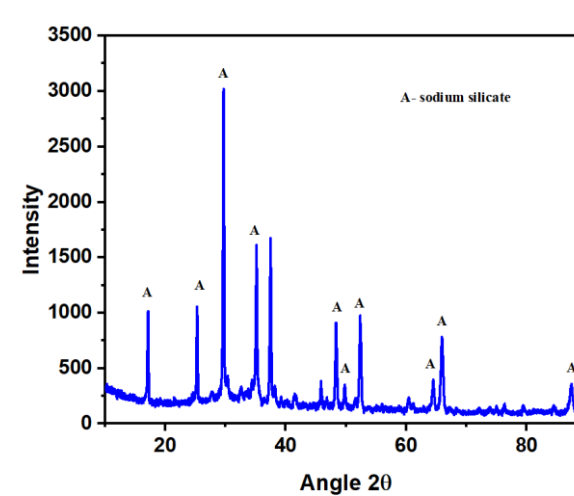
Roasting precipitated sodium silicate



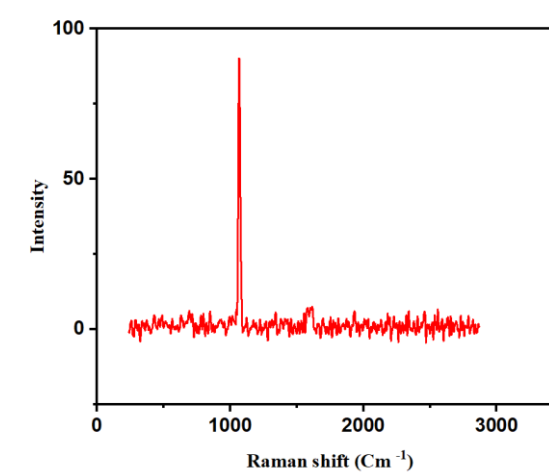
Sodium silicate

RESULTS & DISCUSSION

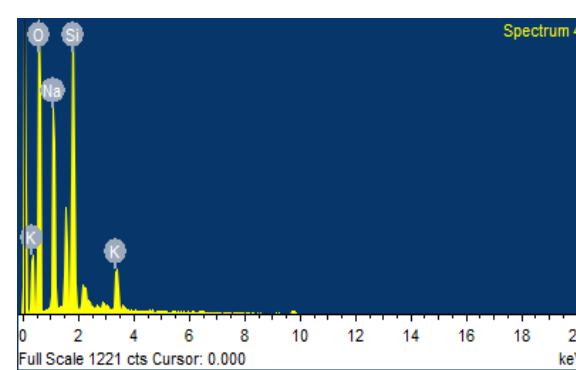
The X-Ray diffraction pattern, Raman spectrum and SEM images of sodium silicate product (Na_2SiO_3) is given. The obtained product having high sodium silicate and low in impurities. Mineralogical analyzes such as XRD, Raman spectrum and SEM analysis confirms the purity of the material obtained in the study.



XRD pattern of product



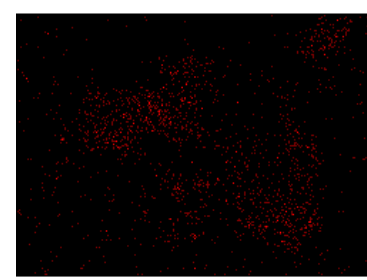
Raman spectrum of product



EDS spectrum of analyzed region

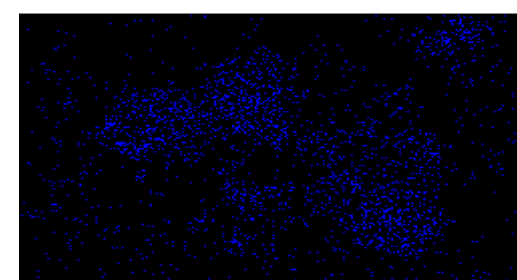


Electron Image 1



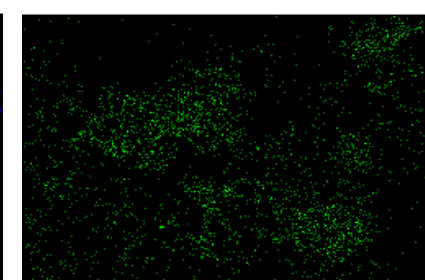
Na Ka1_2

Elemental mapping of Na



Si Ka1

Elemental mapping of Si



O Ka1

Elemental mapping of O

CONCLUSION

The study demonstrates economic friendly utilization of silica waste generated from clay industry for the bulk utilization through the production of sodium silicate and the methodology can be adoptable in MSME industries that creates the new pathway for circular economy.