Synthesis of Silica Nano Powder Extracted from Slopeng Natural Sand via Alkalifussion Route



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Backgraound

Crystal structure of silica (SiO_2) are Quartz, Tridymite and Crystobalite, and also orde nano of SiO_2 have an Amorf phase. SiO2 is formed by strong, directional covalent bonds and very strong, has a high melting point~1700ºC, hard, and insolube in water an organic solvent. The bond angles around O-Si-O are essentially the tetrahedral angle, 109 degrees; the Si-O distance is 1.61 A (0.16 nm) with very little variation,

Trabelsi has been successfully synthesized an amorphous silica from inorganic material, such as sand of Deuriet by reacting sodium carbonate (Na_2CO_3) with heating temperature of 1030ºC [1]. Hidetsugu Mori has been proposed another synthesis approach to obtain 99.9% of silica in a way of breaking the chemical bonding using alkali solution, like KOH and NaOH and then followed by bonding the silica (SiO_2) from waste colore glasses [2-3], this method is known by alkalifussion method.

Methods and Materials

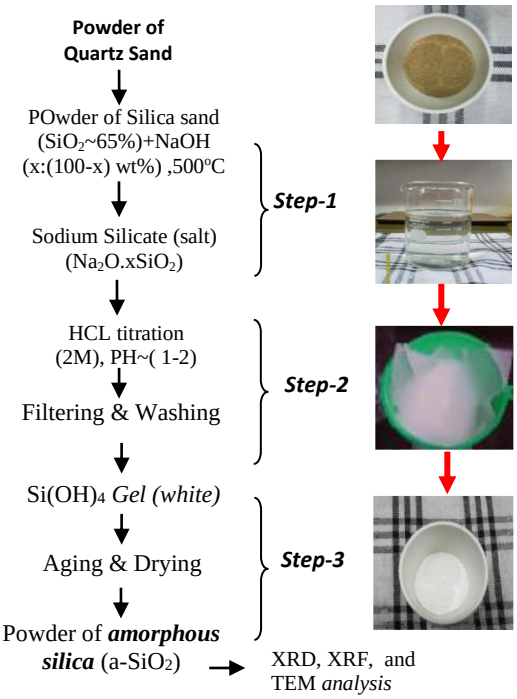
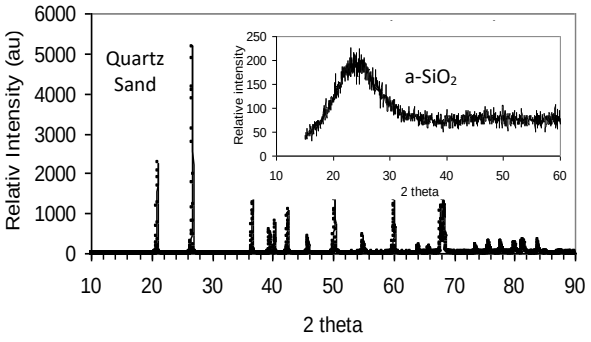


Figure 1 Synthesis process of nano silica powders with alkalifusion methode.

Result and Discusion

The silica nano-order has to be purified and synthesized from quartz sand taken from Madura Slopeng with alkalifusion method. Quartz powder mixed with NaOH in the ratio 12,5:87,5 wt% and burned in a furnace at 500ºC temperature with holding time 2 hours. Sodium silicate obtained and processed as above flowchart, obtained SiO2 powder with nano-order size and an amorphous phase.



Sample	*Si Atomic (%)*	*SiO_2 (%)*
Sand Quartz	58,20	65,90
a-SiO_2 (product)	89,50	98,9

Figure 2 XRD pattern and XRF Characterization of Quarzt Sands and Silica Amorphous (Synthesis)

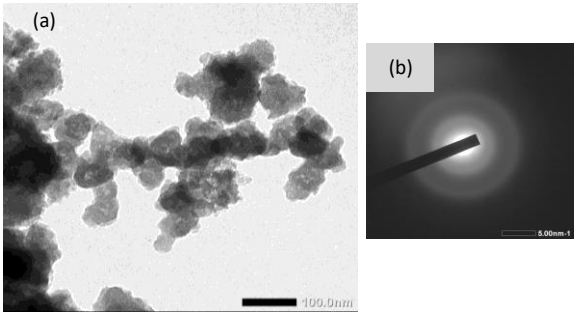


Figure 3 TEM images of silica produced (extraction with 87,5% NaOH), (a) particle size is < 100 nm, particles agglomeration and (b) amorphous phases.

The result of this works: (1) An amorphous silica can be well synthesized from quartz sand by means of alkalifussion method using NaOH at heating temperature of 500ºC.; (2) The amorphous silica produced by alkalifussion method is 98,9 wt%; (3)Comprehensive characterizations by XRD and TEM revealed to the same results that the silica exhibits a nanomaterial behavior having the particle size of ~70 nm and amorphous phase.

Acknowledgments

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Reference

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