

## The Purification of Silica (diatomaceous earth) by Wet Chemical Process

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Silica is by far the major component of the earth's crust which can be in the form of sand, diatomaceous earth, rice hull ash *etc* [1]. Once purified, silica finds numbers of commercial applications; its most valuable uses are in the production of integrated circuits and optics. Likewise, pure silica is the starting material for the production of solar grade silicon. Thus, a huge amount of high purity silica is required for the supply of the silicon industry which is lately experiencing rapid growth [2]. The purifying process of silica ores should be eco-friendly and low cost. This work is a new pilot line to produce pure silica. The proposed process includes wet preparation of 'water glass' from diatomaceous earth (see Figure 1) and the re-polymerization of silica. The conventional purifying protocol which is based on alkaline dissolution and acid precipitation steps [1] was scrutinized to optimizing, and new steps were added in attempting to reach high purity level. An additional delicate acid leaching process has been proposed which comprised of the leaching using hydrochloric acid (HCl) and separation reagent (see Figure.2). A purity evaluation was performed using inductively coupled plasma tool (Shimadzu Inc, 81000) on the basis of careful considerations, the concentrations of 25 elements including B, P, Al, Fe and Ca were measured. The purification process demonstrated an extremely high efficiency for eliminating Boron to 5N (99.9999%), and it is a

guaranteed and promising method to obtain high-pure amorphous silica (99.999 wt. %)

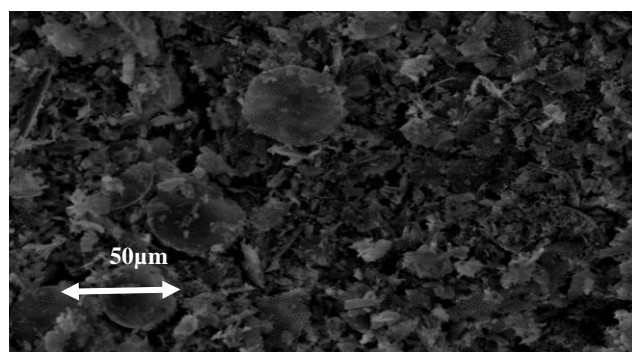


Figure 1. Scanning electron micrograph of diatomaceous earth (starting material)

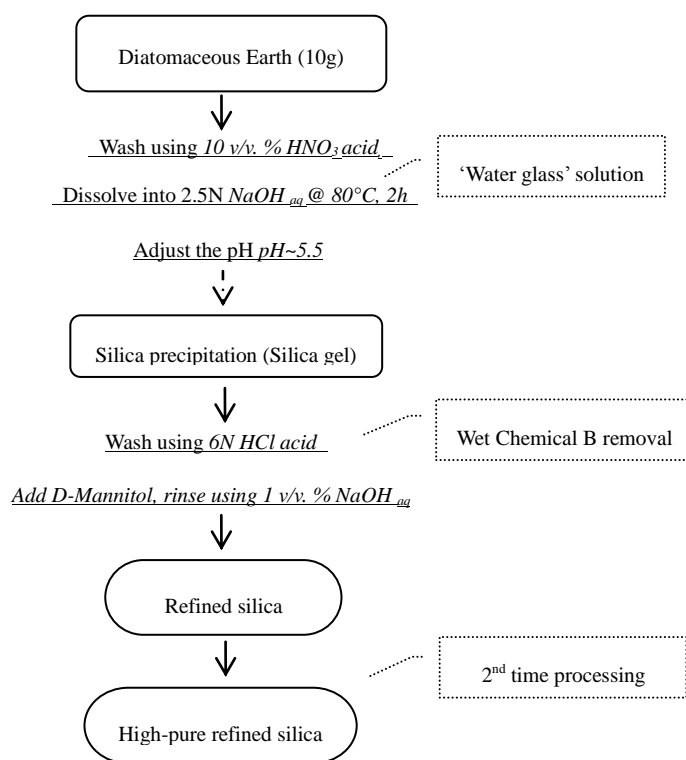


Figure 2. process of high-purity silica from diatomaceous earth

[1] Iler, R. K. In *The Chemistry of Silica*; Wiley-Intersciences: New York, 1979.

[2] Bessho, M. *et al.*, *Energy Fuels* 23 (2009) 4160.