

## Separation of Silica using Micro Ultracentrifuge

### CS-FNX Micro Ultracentrifuge and S52ST Swinging Bucket Rotor

Silica (Silicon Dioxide) is the substance most abundantly contained in the Earth's crust. Making full use of its excellent features, silica is widely used in industrial fields. For example, it is used in silicon wafers, which are semiconductor device materials applied to mobile phones, PCs, and abrasives for polishing them. Utilizing its low absorbability feature, it is blended in eye shadow or foundation to prevent solidification by moisture. It is also used as a reinforcing material for rubber products such as tires and O-rings.

In this paper, we report on the result of separating commercial silica particles using a micro ultracentrifuge with "Differential Centrifugation" method and "Isopycnic Centrifugation" method.

Sodium polytungstate (SPT, density: 1.0 - 3.0 g/cm<sup>3</sup>), a nontoxic heavy liquid, was used because the density of silica particles is 2.0g/cm<sup>3</sup>.

"Isopycnic Centrifugation" is a kind of density gradient centrifugation, separated by density difference using a density gradient medium such as sucrose (less than 1.3 g/cm<sup>3</sup>) or cesium chloride (less than 1.9 g/cm<sup>3</sup>).

#### Description

##### 1. Sample

Silica Particles : sicastar®-Red (micromod Partikeltechnologie GmbH) 300nm, 2.0g/cm<sup>3</sup>

##### 2. Devise and centrifugal conditions

Centrifuge: CS150FNX Micro Ultracentrifuge

Rotor: S52ST swinging bucket rotor (4 tubes)

Centrifuging tube: 5PET tubes

Rotating speed: 40,000 rpm

Maximum RCF: 163,000 Xg

Centrifugal time: 5 minutes

Accel/Decel Mode: "8"/"7"

Temperature: 20°C

Centrifugal method: 1) Differential Centrifugation

2) Isopycnic Centrifugation

\*Density gradient solutions: 1.6, 2.0, 2.4g/cm<sup>3</sup>

##### 3. Results and discussion

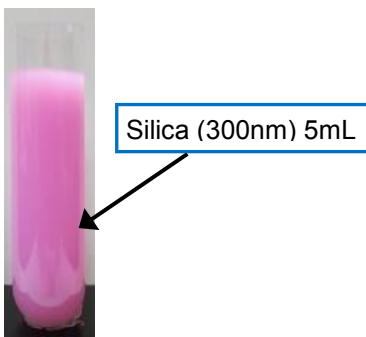

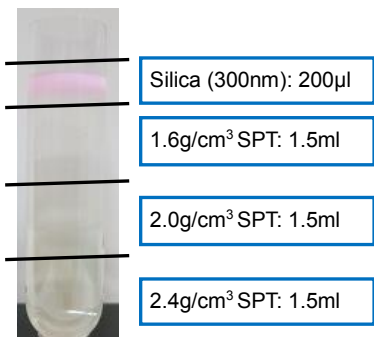

By differential centrifugation, 300nm silica particles with high g-force, 163,000Xg concentrated and precipitated at the bottom of the tube.

By Isopycnic centrifugation, silica particles concentrated to 2.0g/cm<sup>3</sup> density fraction and formed a bundle.

Fig.1 shows the results of centrifugation.

The results indicate the possibility of the following applications.

- 1) By density gradient centrifugation, forming target particles bundle and they are separated from foreign matters.
- 2) Collecting the target particles bundle and by differential centrifugation, they are purified and concentrated.

Centrifugation Method	Before Centrifugation	After Centrifugation
Differential Centrifugation		
Isopycnic Centrifugation		

**Fig.1 Results of centrifugation**

**Instrument**



**CS150FNX**  
Micro Ultracentrifuge

or



**CS150NX**  
Tabletop Micro Ultracentrifuge



**S52ST**  
Swinging Bucket Rotor

If you have any inquiry of this application or products, please contact us through our web site.  
<http://centrifuges.hitachi-koki.com/>

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