

Application News

Nano Particle Size Analyzer: SALD-7101

No. 5

Evaluation of Particle Dissolution Process

The phenomenon in which particles are dissolved is a very ordinary phenomenon which occurs every day in a variety of situations. However, one can assume that there have been almost no attempts to quantitatively observe how the particle size distribution (particle diameter) changes during the dissolution process.

Because the Nano Particle Size Analyzer SALD-7101 is capable of particle size distribution measurement at time intervals as short as one second, it is now possible to observe the time-course behavior of particle size distribution (particle diameter) during the dissolution process. As shown in Figure 1, as the particles in the cluster become finer, the specific surface area increases, and the contact area with the liquid for each unit of mass or unit of volume grows. Therefore, it is clear that small particles dissolve faster.

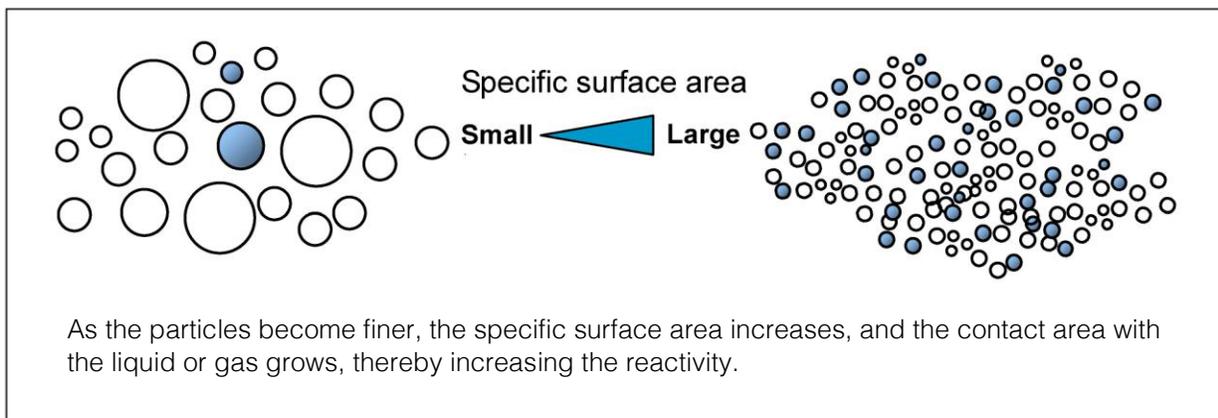


Figure 1: Relationship between Particle Diameter and Specific Surface Area

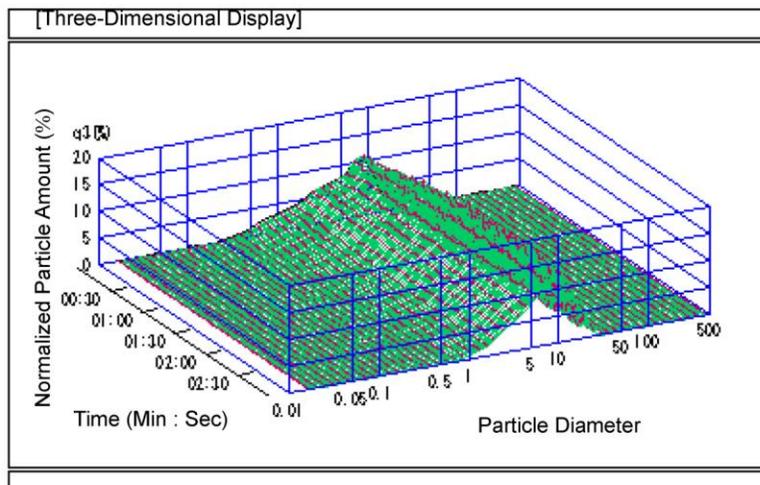


Figure 2 shows the observation results of the dissolution process of calcium carbonate. The results (particle size distribution) depict a three-dimensional view of measurements (observations) taken at one-second intervals over the entire three-minute process.

Figure 2: Calcium Carbonate Dissolution Process

Figure 3 shows the data for the same dissolution process of Figure 2, indicating the changes in light intensity distribution (upper graph) and in particle size distribution (lower graph), at 20-second intervals. As dissolution advances, each particle becomes smaller, and the smaller particles eventually dissolve completely, so that a gradual decrease in light intensity is observed. Moreover, it can be observed in the particle distribution data that dissolution progresses from the very small particles first, due to the large specific surface area associated with the small particles. This is especially evident in the area within the circle.

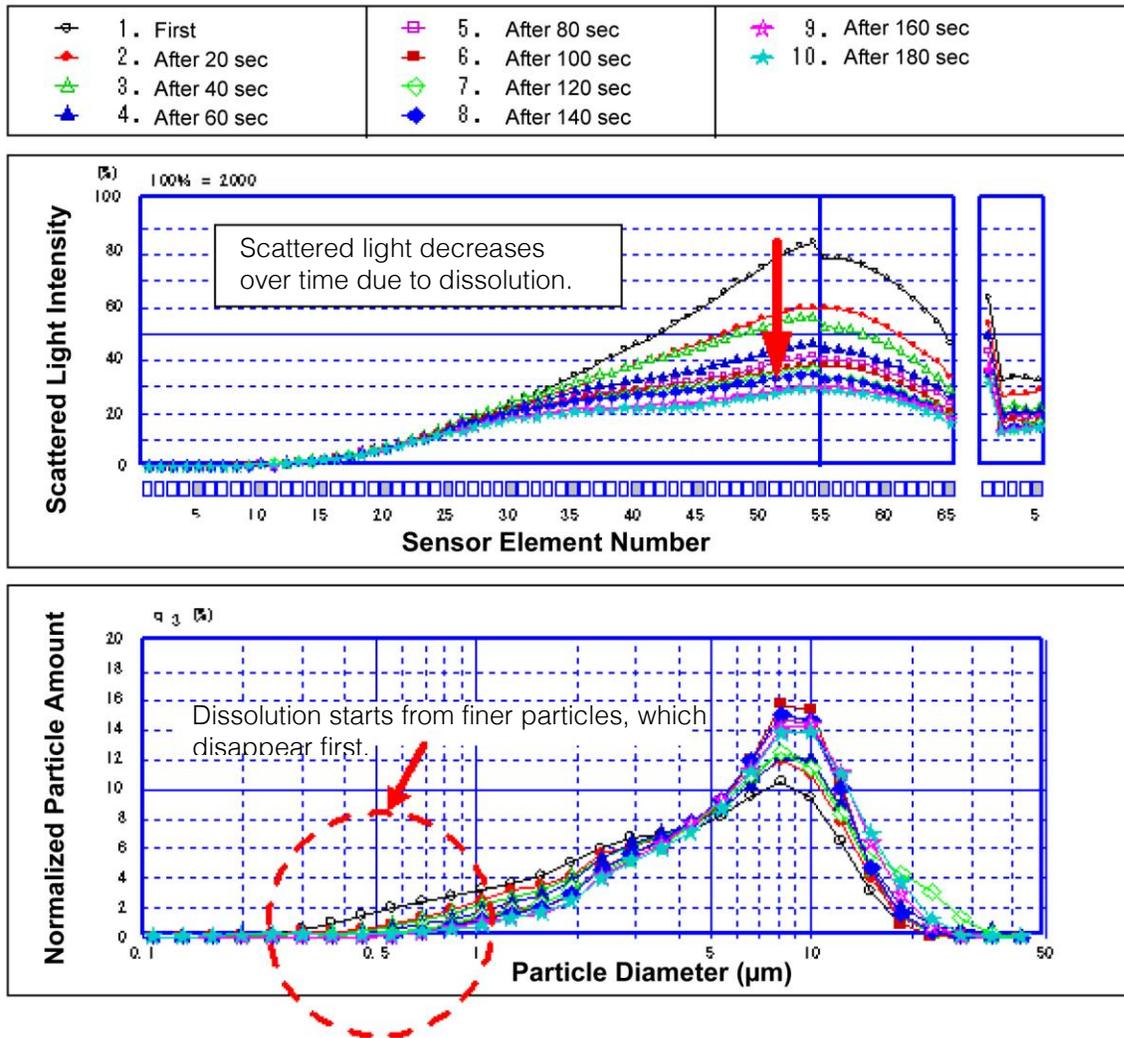


Figure 3: Calcium Carbonate Dissolution Process (Light Intensity Distribution Data and Particle Size Distribution Data)

Using the SALD-7101 in this way, not only is it possible to observe changes in particle size (particle diameter) distribution, but the dissolution process can be quantitatively observed as changes (decreases) in the light intensity distribution data obtained from the laser diffraction and scattered light measurement.