SHIMADZU

Application News

Powder Property Analysis No.Q109

Particle Size Distribution Measurement of Powdered Milk

■ Introduction

Powdered milk (infant formula) starts out with typical cow's milk as the raw material, and various types of ingredients are added and modified as necessary for use by infants. Of course, since the initial raw material is cow's milk, one of the principal ingredients is fat globules.
When the powdered milk is dissolved in hot water in preparation of the milk formula, these fat globules float freely in the hot water, forming a so-called oil/water emulsion. The particle distribution of these fat globules can be measured using the laser diffraction and scattering technique.
Since it is believed that the particle distribution of these fat globules can to some degree affect their digestion and absorption in the body, this is one of the physical properties that must be evaluated in the quality control process.
In this report, we introduce this measurement for 2 different kinds of powdered milk using the Shimadzu SALD-7101 Nano Particle Size Analyzer. In addition, we conducted testing to determine whether or not the fat globule particle size distribution was affected due to the hot water temperature used during preparation of the infant milk formula. These results also are presented.

■ Difference in Particle Size Distribution of 2 Types of Powdered Milk

The particle size distributions of 2 different powdered milk products were measured using the Shimadzu SALD-7101 Nano Particle Size Analyzer (Fig. 1). The measurement results are shown in Fig. 2.
The preparation directions specified that the products be dissolved in hot water at 70 °C or higher, and here we used hot water at 80 °C. Both powdered milk products had a relatively sharp distribution, with a median particle size of about 1 µm.
Although both of these products were produced with the same objective, some degree of difference can be observed in their particle size distributions. This is thought to be due to a variety of factors, such as the technique for emulsifying the milk raw material, the influence of other constituents in the milk mixture, as well as the method of subsequent processing.

Fig. 1 Nano Particle Size Analyzer SALD-7101

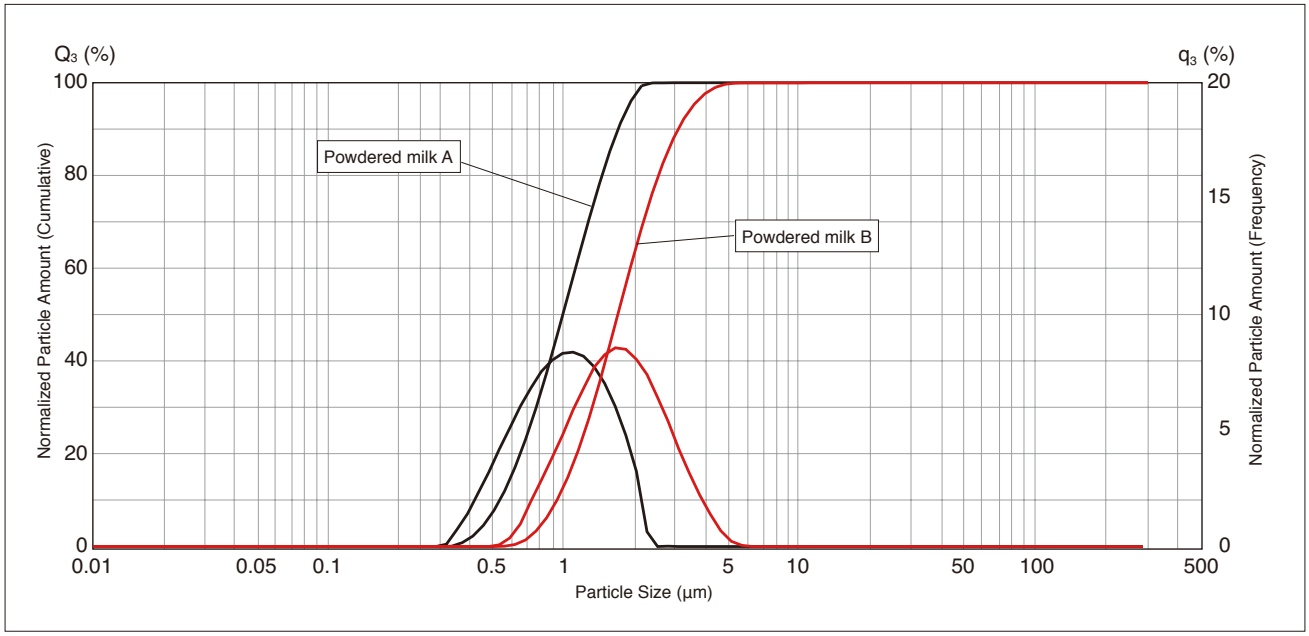

Fig. 2 Particle Size Distribution of 2 Types of Alumina Powder

■ Difference in Particle Size Distribution of Powdered Milk Due to Preparation Temperature

Next, to see whether or not there would be any difference in particle size distribution due to the actual milk preparation procedure, we prepared several milk samples using the abovementioned powdered milk B, but using hot water at different temperatures. Fig. 3 shows overlaid particle distribution curves generated using milk samples that were prepared with hot water at 80 °C, 40 °C and 23 °C, respectively.

Almost no difference is seen between 80 °C and 40 °C, but at 23 °C, the existence of somewhat coarse particles is observed.

Powdered milk is a powder produced by drying the original milk emulsion, but when it is returned to the emulsion state by dissolving it in hot water, it appears that its state depends on the preparation temperature.

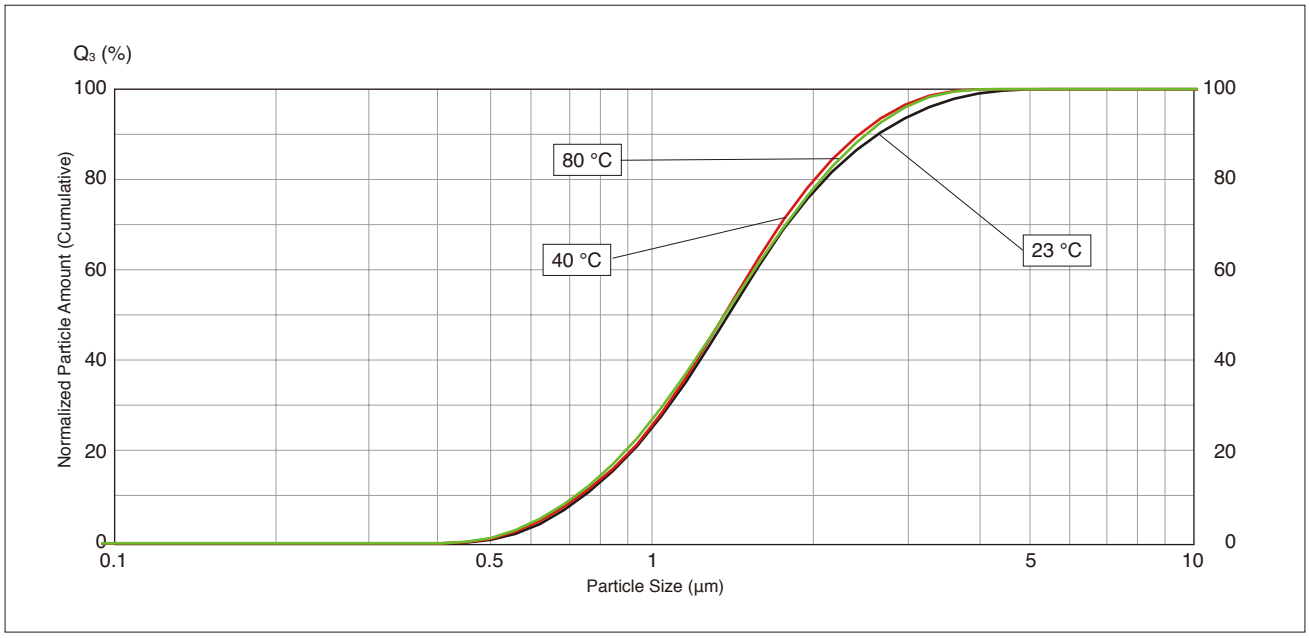

Fig. 3 Difference in Particle Size Distribution of Powdered Milk Due to Preparation Temperature

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SHIMADZU CORPORATION. International Marketing Division

3. Kanda-Nishikicho 1-chome, Chiyoda-ku, Tokyo 101-8448, Japan Phone: 81(3)3219-5641 Fax. 81(3)3219-5710

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