TA1023 - Shape deformation of glass powders

Introduction

The shape of the glass powder significantly changes due to changes in the viscosity of the material after glass transition temperatures. This change may also be referred to as softening point. Shape changes are not revealed on the DSC curve because they are not energy changes, but they are often used in measuring the shape changes in glass powders because they appear as baseline shifts indicated as apparent changes in specific heat capacity in DTA.

Here, the glass powder was measured using DTA8611, a vertical type DTA, and the shape change of the sample was compared with the change in the baseline of the DTA curve.

Measurement and results

Figure 1 shows the DTA measurement result of glass powder. The measurement was performed with a sample amount of 75mg and heated in air atmosphere at a heating rate of 20° C/min. Figure 2 shows the images of the sample shape after stopping the measurement in each temperature. The DTA result shows a baseline shift due to glass transition at 740°C. After which, the baseline shifts in the endothermic direction near 800°C that can be observed in stages. Immediately after the glass transition (image ②), the material is still in powder condition. Then the baseline shift from around 800°C is due to the volumetric shrinkage (image ③). Then, the sample is seen in a float condition (image ④ and ⑤), and gradually has fluidity where the baseline slowly shifts from 1000°C to 1150°C. Finally, the sample has flowed out at 1200°C (image ⑥).



Figure 1: DTA measurement result of glass powders



Figure 2: Images of sample changes in different temperature regions