Using the Minimum Signal Fraction Feature in the Saturn DigiSizer Application

The light scattered by particles is only a portion of the total laser light scattered during analysis with the Saturn DigiSizer. The optical components of the analyzer and the dispersing liquid also scatter light; this is known as *background scattering*. The light scattering strength by the particles above that of the background is called the *scattering signal fraction*. In order to limit the effects of scattering noise, a threshold known as the **Minimum signal fraction** can be specified in the Saturn DigiSizer sample information file. Any collected data that do not exceed the background by this specified intensity percentage are not used in particle size calculations.

The minimum signal fraction default value is 16%. This means that scattering data collected which have intensities equal to or greater than 16% above the background level at that angle are used in the particle size calculations. Data points where the scattering intensity is less than 16% above the background are not used in calculations, although data are collected at all angles where the intensity is 3% above the background.

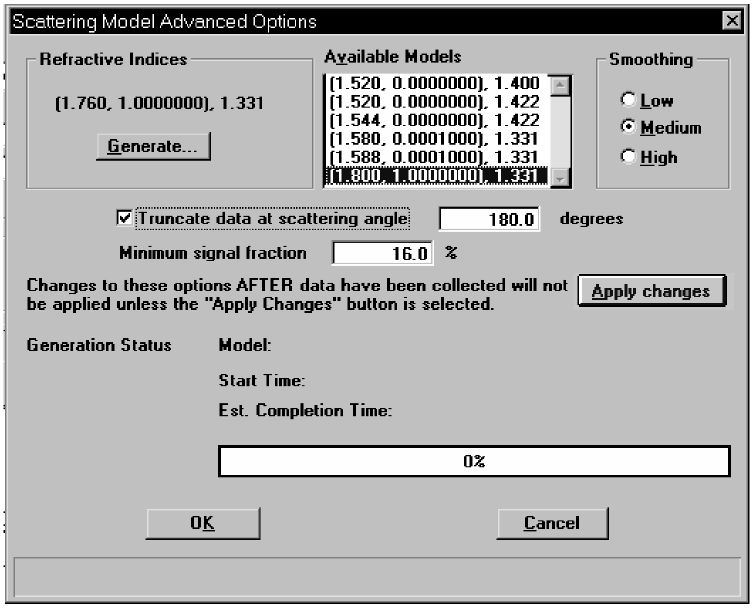
If you need to increase the signal fraction at particular angles, increase the concentration of the sample. This results in a linear increase in signal fraction and, therefore, data at more angles (generally smaller angles) are used. This also allows detection of larger particles which may have been missed in the original experiment. There is a limit, however, in using higher concentrations. If small particles are present, multiple scattering may result. In this case, what do you do in order to size the larger particles in the presence of the smaller ones in a sample with a broad particle size distribution? You change the minimum signal fraction to allow more data to be used.

In Figure 1 the original default minimum signal fraction of 16% is used to calculate the size of an alumina sample analyzed with an obscuration of 10.9%. The large end of the distribution is artificially truncated because the signal from the larger particles is less than 16% above background. For this sample, the concentration could not be increased to raise the signal for the larger particles since doing so would result in multiple scattering by the smaller particles. This can be seen in Figure 2 when the sample is analyzed with an obscuration of 29.0%. In Figure 3 the minimum signal fraction is reduced to 5% for the original sample. Notice that the full distribution is calculated since the largest size is the same as when the concentration was increased (Figure 2).

So, should you always use a lower signal fraction rather than a higher concentration for samples that contain only large particles? No; use a higher concentration when possible. This improves the statistics, and thus the reliability, of the analysis since a larger number of total particles is analyzed. It also reduces the effects that noise can have on the analysis.

micromeritics®
One Micromeritics Drive, Norcross, Georgia 30093
T. (770) 662-3620 • www.micromeritics.com

To access the **Minimum signal fraction** field: With the desired file open and your sample presentation in the Advanced format, click the **Material Properties** tab. Then click **Options**; the Scattering Model Advanced Options dialog is displayed.



Edit the value in the **Minimum signal fraction** field, then click **Apply changes** to recalculate the particle size distribution with the new minimum signal fraction.

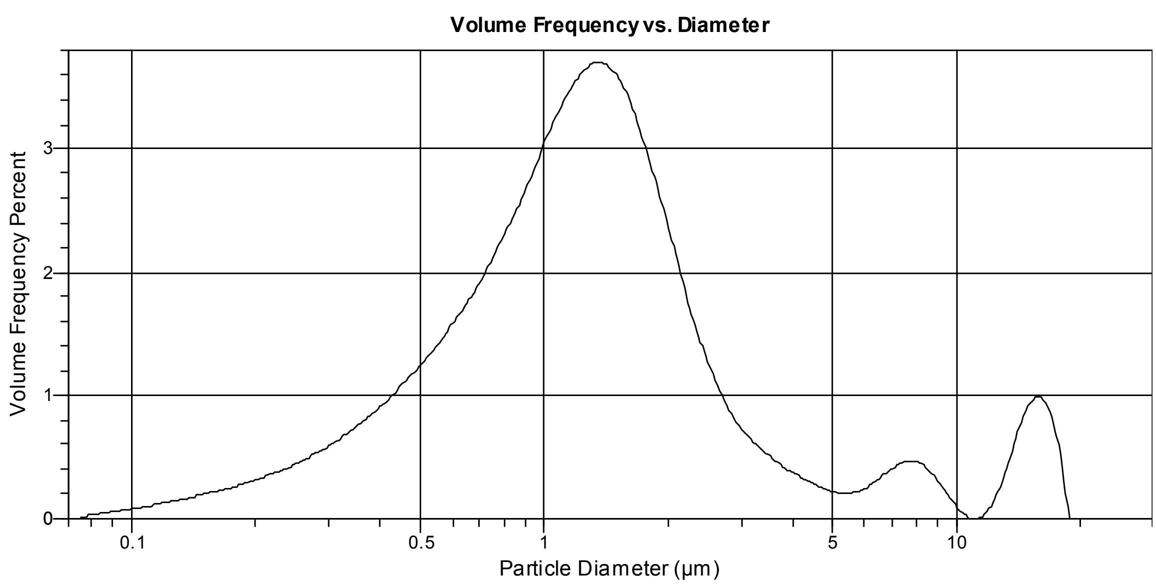


Figure 1. Alumina sample analyzed at 10.9% obscuration and 16% minimum signal fraction.

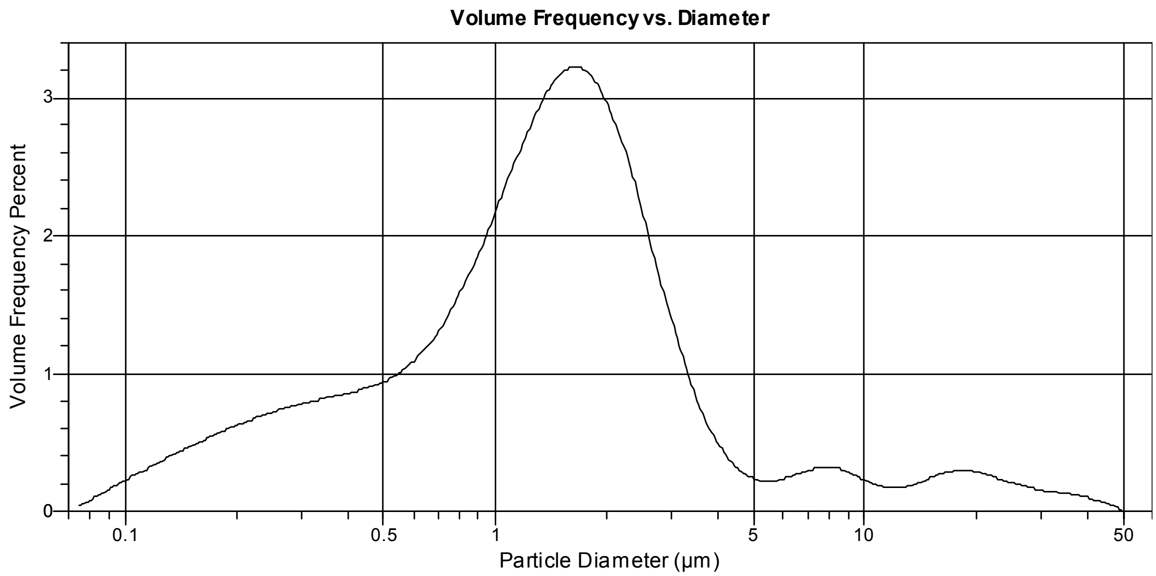


Figure 2. Alumina sample analyzed at 29.0% obscuration and 16% minimum signal fraction.

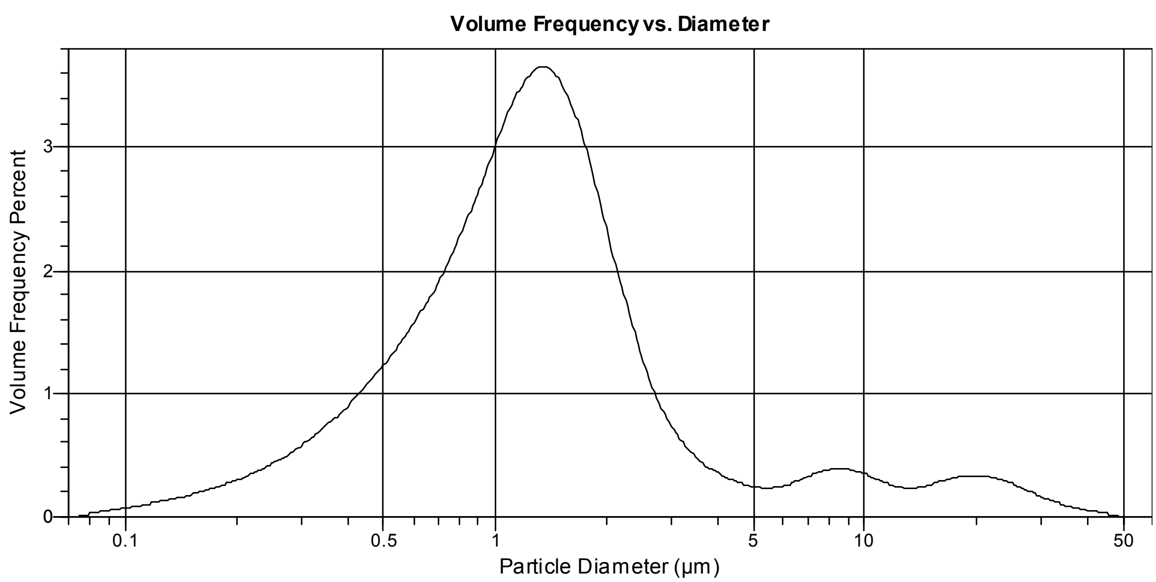


Figure 3. Alumina sample analyzed at 10.9% obscuration and 5% minimum signal fraction.