

## **A reliable laboratory test to distinguish between flocculated and non-flocculated dispersions at original concentration**

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Dispersions are widely used for industrial, food or pharmaceutical products. The product application and quality depends strongly on the state of the dispersion regarding particle interaction.

In this paper we present a test protocol based on multisample analytical centrifugation to distinguish between flocculated dispersed particles in liquid-solid dispersions at semi- and high concentrations. The new multisample approach uses the STEP-technology. Space and time resolved extinction profiles quantify the alteration of particle concentration and packing behaviour during centrifugation under alternating centrifugal load. The separation behaviour of quartz (repulsive forces) and limestone suspensions (moderately and strong flocculated) are used to demonstrate the test procedure.

In general, stable dispersions are characterized by a fast settling time and a high sediment packing concentration (up to 70% for polydisperse quartz dispersions). The final packing concentration is only slightly influenced by increasing the centrifugal acceleration. Flocculated dispersions show a much slower time course of the separation and result in packing densities, which are by a factor of two to five lower. In addition, an increase in the centrifugal force reduces the height of the sediment (increase in mean packing concentration).

The packing concentrations in dependence on the dispersed state of the dispersion and the excess pressure generated by the centrifugal force were independently measured by means of X-ray adsorption over the sediment height. The results regarding the sediment density correlates very well. In addition it was obtained that for a stable dispersion the density only slightly depends on the position within the sediment, whereas flocculated dispersions form a sediment with a distinct gradient of the packing density.