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Behaviour of dispersed magnetic nano- und microparticles in gravitational and centrifugal fields with superimposed magnetic fields.

Characterisation of particles used in the field of nano- and biotechnology gains importance as the structure of these particles becomes more and more complex. This, on one hand is due to the product requirements (e.g. magnetic beads) as well as due to the need to optimise the numerous separation processes in industrial production. To meet these requirements, beside the particle shape and size, electric and magnetic properties of these innovative particles have to be analysed.

In principle, today the measurement of particle size as small as a few nanometers is solved for routine applications and progress has been made to characterise and to measure the particle shape (cp. standards of the ISO/TC24/SC4). Characterisation of the magnetic properties of particles and the influence of magnetic fields upon the behaviour of dispersions made from magnetic particles are only beginning to be explored.

This contribution presents results in which way static magnetic fields influence the sedimentation in gravitational or centrifugal fields. Magnetic particles were characterised by special adjustments, which allow the superposition of magnetic fields, to analytical instruments developed to quantify the stability of dispersions (LUMiReader, LUMiFuge). Magnetic fields may be varied regarding the magnetic field strength as well as the field orientation (orthogonal or parallel to the sedimentation). We describe the results for magnet field-superposed separation behaviour in gravitational or centrifugal fields of magnetisable model particles and magnetisable biological cells. It was found experimentally and theoretically that the so-called "bridge formation" of magnetic particles does not depend on the particle size and may be used to quantify the magnetic properties of different particle classes. We point out the potential of this technique to characterise functionalised magnetic beads and to perform their quality control in the production process.

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