

## Using a Magnometer to Optimising the Use Concentration of Surfactants and Polymers

Understanding the extent of coverage of the particle by a surfactant or a polymer is an important part of formulation development in a variety of industries. Inadequate coverage of the particle surface can result in unstable formulations.

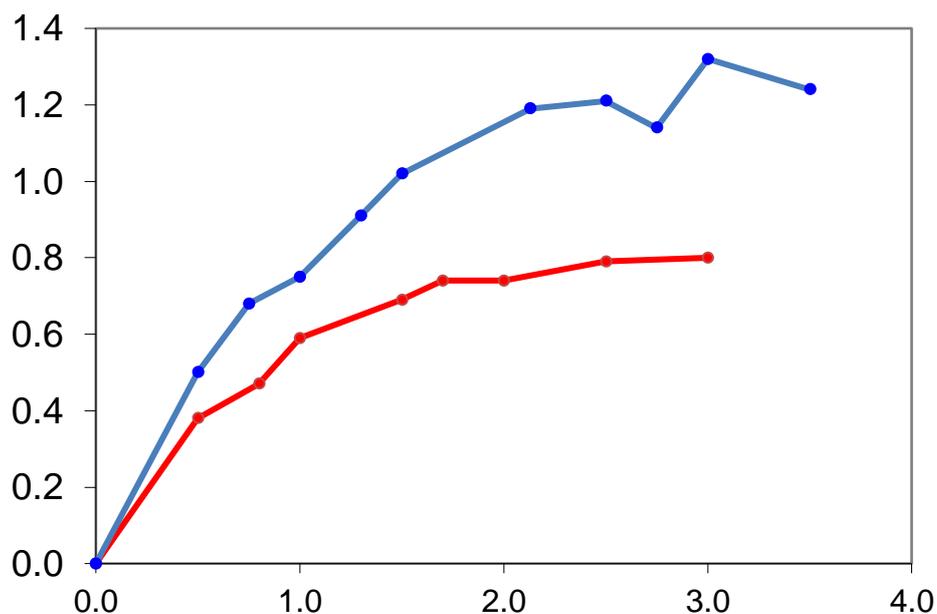
The concentration of dispersing aid needed is typically 10%-20% of the particles by mass and can be higher depending on the fineness of the dispersion. Surfactants and polymeric materials can be expensive, hence optimizing their concentration in a formulation is important to producing the best product possible at the lowest costs.

Determining an adsorption isotherm for a solute onto a surface by traditional means is time-consuming and is not a trivial exercise. In contrast, the technique used in the Mageleka Magnometer HRS is based on NMR relaxation; determination of the adsorption of solutes on to the surface of materials using such a device is straightforward.

Here we show two simple adsorption isotherm experiments – for a surfactant and for a polymer, respectively.

Figure 1 shows the change in the relaxation rate as a function of addition of a surfactant (sodium dodecyl ethoxy sulphate) to a 50nm silica aqueous dispersion for two solids concentrations – 5wt% (red) and 10wt% (blue).

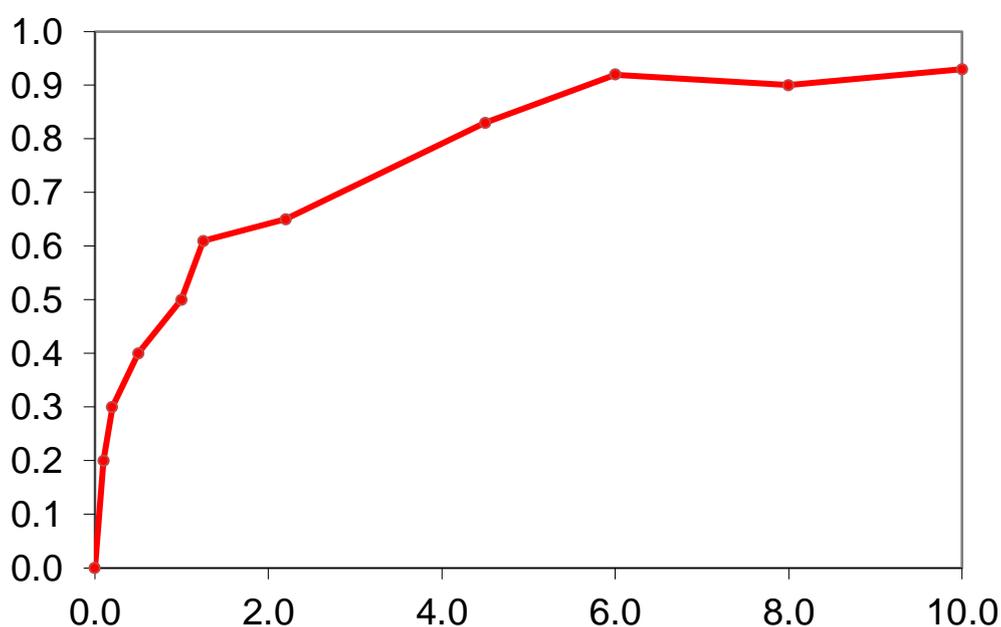
**Figure 1: Adsorption of a Surfactant onto a Silica**



Measurements are made directly on the suspensions. As the surfactant at the interface reaches a monolayer of coverage, the relaxation rate plateaus. The results are quantitative; in this example, the optimum surfactant concentration is ca 3.0%.

The second example (Figure 2) shows the adsorption of polyvinyl pyrrolidone (PVP) onto 15nm silica particles. PVP is a water-soluble polymer used extensively in coatings applications (paints, inks, adhesives) as well as personal care products and pharmaceutical formulations. Here the data is plotted as PVP added per unit area of silica.

**Figure 2: Adsorption of a Polymer onto a Silica**



In this example, the optimum PVP concentration is ca 7mg PVP/m<sup>2</sup> silica.

Understanding the adsorption of surfactants and polymers onto the surface of inorganic and organic particles is a key to the preparation of stable dispersions.

Magnometer measurements can be run in real time and could be extremely useful not only in R&D but also in QC. Using the Mageleka Magnometer HRS enable manufacturers to optimize the amount of dispersant/stabilizer needed in milling and grinding processes, or to compare/contrast the efficiency of different polymers (e.g., MWt, structure).