TECH TIP 09

Measuring Zeta Potential of Non-aqueous Suspensions

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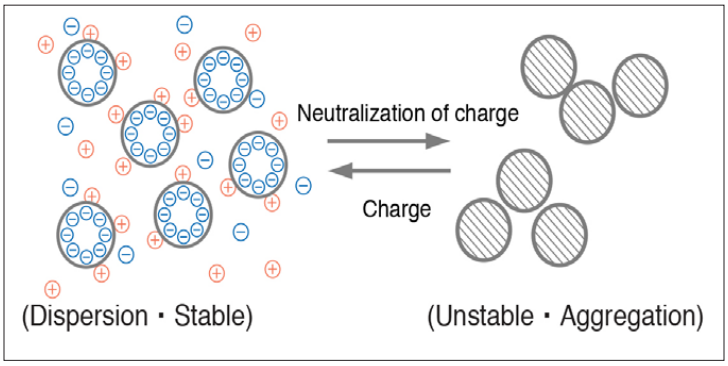
Submicron particles suspended in liquid medium are regularly utilized in many industries, from food and pharmaceutical production to lubricants for machinery. The stability of these suspensions is vital to their function and shelf-life. The typical way to characterize the stability of a suspension is to measure the zeta potential of the suspension.

So what is zeta potential and how is it used to determine suspension stability?

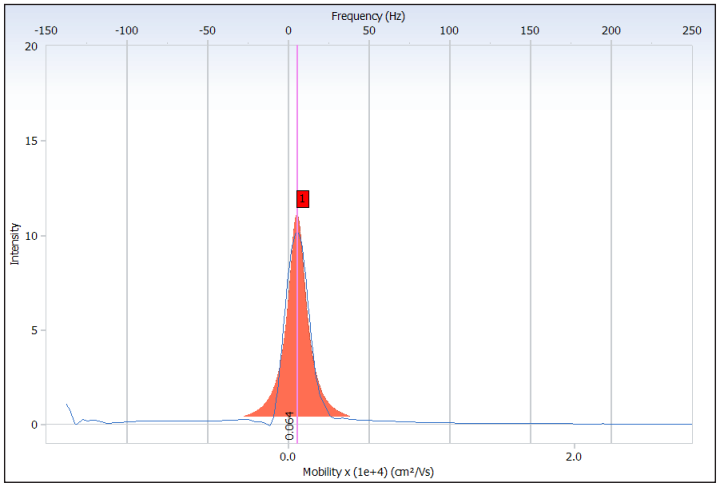
Particles and the suspending medium always have some kind of charge associated with them. For the particles, it is the surface charge and surrounding ions. For the medium, it is either polar forces of the molecules or the presence of surfactants or other charged molecules. In the event the particles are suspended in a non-polar solvent, there is still a chance that the particles will be attracted to each other and form agglomerates, or larger particles. The formation of larger particles will eventually lead to the separation of the suspension. Some stabilizing additive may be needed to cause the particles to repel each other, thereby stabilizing the suspension.



To measure zeta potential, a current is passed through the suspension and the electrophoretic mobility of the particles is measured by electrophoretic light scattering (ELS). Since it is difficult to pass a current through low polarity to non-polar organic solvent, i.e. low dielectric constants, an analysis cell must be optimized to make this measurement.

It is not appropriate to treat organic media, such as benzene, toluene, or tetrahydrofuran, as if they are as conductive as water.

The NanoPlus sold by Particulate Systems, a Micromeritics brand, has a specialized accessory cell compatible with organic media and optimized electrode positioning to make these types of zeta potential measurements possible. It is made of high quality quartz for maximized optical performance. The user friendly software calculates zeta potential using the Hückel calculation model. This differs from measurements in aqueous media, where zeta potential is calculated using the Smoluchowski model.



Diluent	Temperature (°C)	Refractive Index	Viscosity (cP)	Dielectric Constant
Water	25	1.3330	0.8904	78.3
Acetone	20	1.3589	0.326	20.7
Isopropanol	30	1.3770	1.77	18
Methanol	25	1.3312	0.547	33.6
Benzene	20	1.5011	0.652	2.28
Toluene	20	1.4969	0.590	2.4
Cyclohexane	20	1.4264	0.696	2.02

*Property data presented in NanoPlus Operator's Manual from multiple sources. Please see manual for additional values and references.

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