PARTICLEMETRIX

Application Note – Colloid Analysis

# C20 - Controlling critical coagulation of pigments and fillers

## In-situ measurement of nano size

Particle charge is one of the vital parameters[1] in coating and retention optimization. pH setting and additive control belong to the daily work in that field of wet end paper processing. Simultaneous size probing makes the charge influence on particles obvious. Two kinds of particle charge titrations, zeta potential vs. pH AND zeta potential vs. polyelectrolyte consumption generate comprehensive information. All this is realized in the DUO Stabino® & NANO-flex with efficiency tailored SOPs.

## The critical point of coagulation

The zero point of charge (ZPC) and the iso-electric point (IEP) of any particle dispersion are seen as the maximum point of instability. We speak of ZPC, when a titration of the sample with an anionic or cationic polyelectrolyte additive has reached 0 mV of the particles zeta potential or of the streaming potential. Correspondingly, when the dispersion is titrated versus pH, the iso-electric point IEP is the pH with 0 mV potential. By synchronously following the titration with a size distribution measurement, coagulation can be observed long way before the ZPC and IEP are gained. The moment when coagulation starts is path breaking for any dispersion.

Typically, by titrating an alumina dispersion used in coating of ink jet paper with NaOH, coagulation is observed already at pH 7 (Fig.1), whereas the IEP is at pH 8.4 Between pH 4 and 6, the dispersion is stable with particle size at 160 nm, whereas the dispersion is fully flocculated at the IEP. The monitor signal is zeta potential known as a stability indicator in electrostatic repulsion formulation.

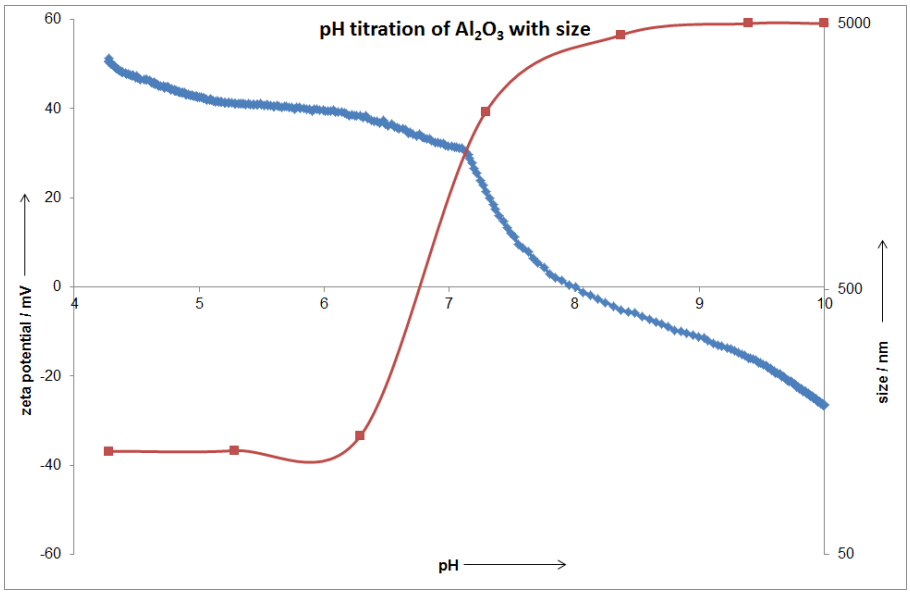



**Figure 1**: Blue curve: Fast particle charge titration of an alumina dispersion with NaOH. Red curve: Simultaneous size [nm] measurements.

An adequate control is required when pigment particles are coated to be kept in a well dispersed state whilst keeping the retention of the fillers at optimum condition. As an example, the same suspension at pH 4 is exposed to a polyelectrolyte solution until the ZPC is reached (fig.2). In an appropriate manner, the critical coagulation point is detected far ahead of the ZPC.

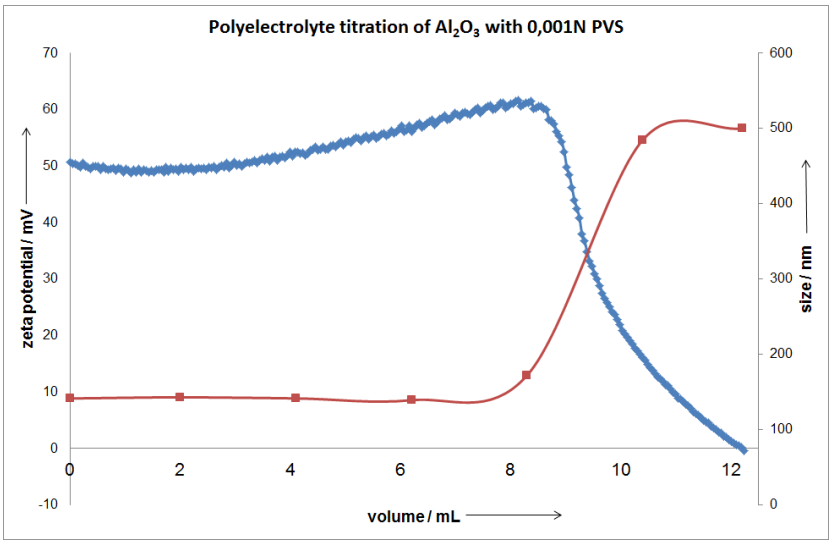
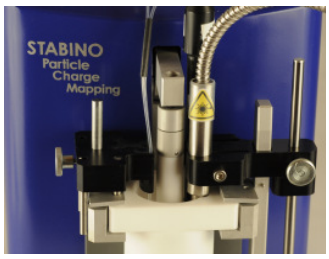



**Figure 2:** Polyelectrolyte titration with simultaneous size measurement

## All Analyses with one System

Today, you do titrations with the Stabino® Particle Charge Mapping device, as they are fast and unparalleled in information - from sub-nanometer to micrometer, from 0.01% up to 40%v sample concentration, from 0 to 300 mS/cm conductivity. Color, absorbance or shape of the sample do not limit the application. Whilst pH and conductivity are automatically monitored, zeta AND streaming potential function as particle charge monitoring signals. For simultaneous size measurement, the probe of the NANO-flex 180° DLS sizing instrument is simply dipped into the measurement beaker of the Stabino®.

**The genes of Stabino® & NANO-flex are tailored for efficiency in quality control and formulation of fine dispersions.**


Stabino® **measures** particle potential, particle size, pH, conductivity and temperature and **titrates** against pH, charge quantity and conductivity


Particle Metrix, November 2013

1) PTS NEWS 01/2008
http://www.ptspaper.de/fileadmin/PTS/Dokumente/Unternehmen/PTS_News/Juni_2008/Seiten_54_55.pdf