COVALENT METROLOGY

COVALENT ACADEMY Q&A

Episode 11: Solid Surface Zeta Potential – Industrial Applications, Challenges and Solutions

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01

Q: Can we measure zeta pot of micro-particles size of 18-55 um?

A: Yes. The instrument of choice for zeta potential of particles as small as 3.8 nm is the Litesizer 500 from Anton Paar. Starting from a particle size of 25 µm, the SurPASS 3 with its proprietary Cylindrical Cell can be used.

02

Q: What effect does dissolved oxygen concentration have on membrane z-potential measurements?

A: Oxygen entry into the electrolyte solution is minimized due to the Nitrogen purge of the electrolyte solution.

03

Q: What are the potential root causes for "zeta potential drift" (a shift in the z-pot vs. pH curve over time for the same material, but not the same sample)?

A: Zeta potential is an interfacial property. If changes of the sample surface can be ruled out, it must be assured that the properties of the electrolyte solution do not change for a stable zeta potential reading.

04

Q: Why does the inert polymer have an IEP of 4?

A: This has to do with the mechanism of charge formation on polymer surfaces. Charge formation on inert surfaces is due to preferential adsorption of OH- ions from the electrolyte solution on the polymer surface. H3O+ ion adsorption dominates at pH < 4 only. For more information see e.g.: Current Opinion in Colloid & Interface Science 15 (2010) 196-202 (https://www.sciencedirect.com/science/article/abs/pii/S1359029410000038).

05

Q: Are there any correlation studies with ToF-SIMS, XPS or AES?

A: Correlations for solid surface zeta potential and XPS can e.g. be found in J. Electrochem. Soc. 141 (1994) 2465-2469 (https://iopscience.iop.org/article/10.1149/1.2055143).

06

Q: Does CO2 in the atmosphere tend to acidify the pH and affect the readings?

A: In principle, yes. However, with SurPASS 3 the electrolyte solution is continuously purged with Nitrogen gas to prevent the CO2 effect. As such, CO2 from the atmosphere does not affect the zeta potential results.

07

Q: If you have an emulsion or suspension with nanoparticles of different sizes (+- 50 nm) how do you differentiate the surface properties of the different particle sizes?

A: A differentiation of surface properties of different particle size is possible only after prior separation of the size fractions.

08

Q: A cationic surfactant can be used to help repel positive particles, for leading-edge semiconductor apps, how do you then get rid of the surfactant than can be nm size and can affect nm range device surfaces

A: An answer to this question requires deeper knowledge on this specific semiconductor application.

09

Q: Will surface roughness affect the zeta potential since it may influence the stream potential?

A: Currently there is no evidence for a correlation between roughness and surface zeta potential.

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