

测 Zeta 电位为什么不能稀释？

什么是 Zeta 电位？

Zeta potential is an electrostatic potential that exists very near the surface of particles suspended in liquids¹. Zeta potential (ζ) is responsible for particle-particle repulsion forces in colloidal suspensions and thus can be used to predict colloid stability against particle aggregation. Figure 1 illustrates a particle suspended in a liquid along with various notional regions around it. The “slipping plane” or “shear plane” is where Zeta potential is located versus the potential in the bulk solution. Within this slipping plane, the liquid is bound to the particle while it moves freely outside this boundary. The net potential far from the particle (in the bulk of the liquid) is zero.

Zeta 电位是液体中悬浮的粒子很接近表面位置的静电势¹。Zeta 电位(ζ)是由胶体中粒子与粒子间的相互作用造成的，因此它可以用来预测胶体体系里粒子聚集的稳定性。图 1 显示了悬浮在液体中的粒子及其周围的各种概念区域。Zeta 电位指的是液体中滑动面或者剪切面的电位。在这个滑动平面内，当液体在这个边界外自由运动时，它与粒子结合在一起。远离粒子的净电势(在液体中)为零。

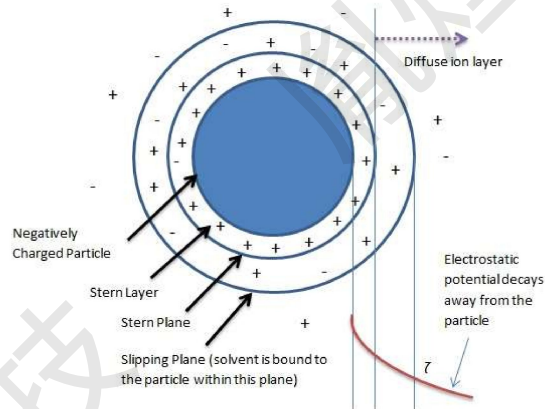


Figure 1. A negatively charged particle suspended in a liquid. Notional boundaries are shown.

图 1 悬浮在液体中的带负电的粒子及其周围的各种概念区域

PS: 这个是另外的一种说法，但是要描述的内容是一样的；

由于分散粒子表面带有电荷而吸引周围反号离子，这些反号离子在两相界面呈扩散状态分布而形成扩散双电层。根据 Stern 双电层理论可将双电层分为两部分，即 Stern 层和扩散层。Stern 层定义为吸附在电极表面的一层离子（IHP or OHP）电荷中心组成的一个平面层，此平面层相对远离界面的流体中的某点的电位称为 Stern 电位。稳定层 (Stationary layer) (包括 Stern 层和滑动面 slipping plane 以内的部分扩散层) 与扩散层内分散介质 (dispersion medium) 发生相对移动时的界面是滑动面 (slipping plane)，该处对远离界面的流体中的某点的电位称为 Zeta 电位或电动电位 (ζ -电位)。

测 Zeta 电位为什么不能稀释?

In aqueous media, Zeta potential is typically generated as the ions on the particle surface dissociate, leaving a net electric charge near the surface surrounded by a cloud of counter-ions. Various types of ions can diffuse in and out through the slipping plane which allows Zeta potential to vary depending on the ion composition in the liquid such as pH. Ions may also participate in chemical reactions within the slipping plane which can affect the Zeta potential. Sample dilution can significantly shift the Zeta potential as ions may adsorb or desorb from the particle. Thus, Zeta potential can be positive or negative, or zero (Iso-Electric Point, IEP) depending on the liquid (solvent) pH or ion type and concentration.

在水相介质中，Zeta 电位通常是由于粒子表面的离子离解而产生的，在表面附近留下一个被反离子云包围的净电荷。各种类型的离子可以通过滑动面扩散进来和出去，滑动面允许 Zeta 电位根据液体中的离子组成而变化，例如 pH 值。离子也可以通过参与滑动面内的化学反应，从而影响 Zeta 电位。样品稀释可以显著地改变 Zeta 电位，因为离子可以吸附或者解析颗粒。因此，Zeta 电位可以是正的或负的，也可以是零(等电点，IEP)，这取决于液体(溶剂)的 pH 值或离子的类型和浓度。

测量 Zeta 电位的方法

Particle-filtration systems may benefit from low Zeta potential levels as aggregated particles are easier to remove. Most other colloidal systems require higher Zeta potentials, e.g. over +/- 20 millivolts in order to maximize shell life. Coatings tend to be more efficient when the particles and coated surface have opposite polarities. Zeta potential normally cannot be directly measured. For example, one cannot place a voltmeter probe against a particle surface in order to measure its surface potential.

Instead, Zeta potential is calculated from electrophoretic measurements which measure particle velocity under an applied electric field, i.e. make the particles move and measure their particle mobility (see www.matec.com/mas). Thus, the calculated Zeta potential depends on the theory used in these computations to relate particle mobility to Zeta potential. An alternative measurement for large particles or surfaces is to move the liquid against stationary particles, fibers, or surfaces and measure the resulting streaming potential.

颗粒过滤系统可能受益于较低的 Zeta 电位水平，因为聚集颗粒更容易去除。大多数其他胶体系统需要较高的 Zeta 电位，例如超过 +/- 20 毫伏，以大限度地提高壳体寿命。当颗粒和涂层表面具有相反的极性时，涂层往往更有效。Zeta 电位通常不能直接测量。例如，不能将伏特计探头靠在粒子表面上以测量其表面电位。相反，Zeta 电位是通过电泳测量来计算的，电泳测量是在外加电场下测量粒子速度，也就是通过粒子移动并测量其粒子迁移率（见 www.yh-tek.com/mas）。因此，计算出的 Zeta 电位取决于这些计算中使用的理论，即粒子迁移率与 Zeta 电

位的关系。另一种测量大颗粒或表面电位的方法是将液体移到静止的颗粒、纤维或表面上，然后测量产生的流动电位。

