Charge Stabilization of Dispersion [pln43]

Surface of colloidal particles can acquire charge via

- ionization through contact with medium,
- physical interactions,
- chemical reactions.

Stability status of dispersion determined by balance between

- van der Waals attractive force,
- partially screened electrostatic repulsion.

Two-parameter DLVO model:[1]

$$V(r) = be^{-r} - \frac{a}{r},$$

where the parameters a, b are scaled in units of $k_{\mathrm{B}}T$ and the distance r in units of the Debye screening length r_{D}.

The DLVO model does not take into account any short-range repulsion of the hard-core type.

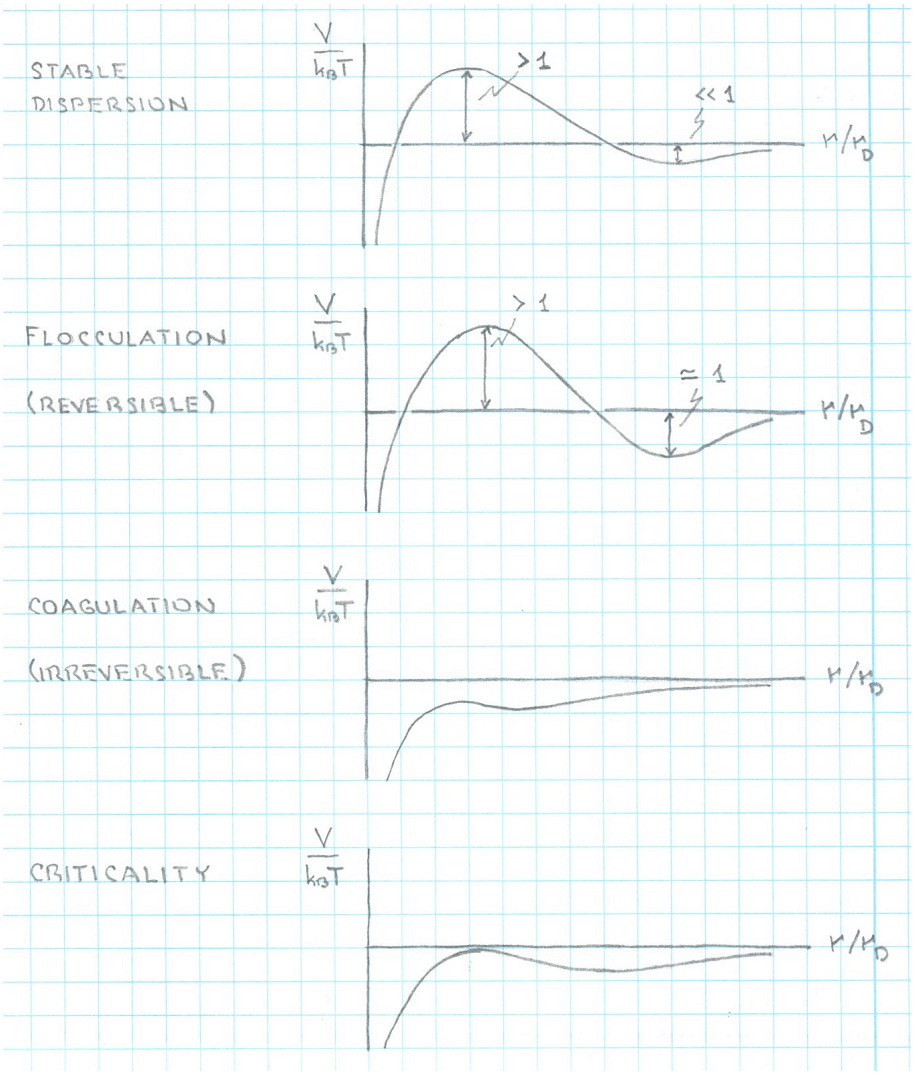
Depending on the parameter range this model predicts equilibrium states in the form of

- a stable dispersion,
- flocculation (reversible aggregation),
- coagulation (irreversible aggregation).

Aggregation of either kind is likely to lead to sedimentation or creaming.

The parameter regimes are identified in [pex26] and illustrated below.

[1] named after Derjaguin, Landau, Verwey, and Overbeek.


STABLE
DISPERSION
V / k_B T
> 1
<< 1
H/H_D
FLOCCULATION
(REVERSIBLE)
V / k_B T
> 1
≃ 1
H/H_D
COAGULATION
(IRREVERSIBLE)
V / k_B T
H/H_D
CRITICALITY
V / k_B T
H/H_D