DOI: https://doi.org/10.25532/OPARA-693

Research data for:

"Forces during film drainage and detachment of NMC and spherical graphite in particle-bubble interactions quantified by CP-AFM and modeling to understand the salt flotation of battery black mass"

Jan Nicklas, Claudia Heilmann, Lisa Ditscherlein, Urs A. Peuker*

TU Bergakademie Freiberg, Institute of Mechanical Process Engineering and Mineral Processing; Agricolastraße 1, 09599 Freiberg, Germany

This dataset characterizes the particle-bubble interaction for single battery black mass particles (NMC 622 and spherical graphite) in sodium chloride solutions (0.001 mol/L to 0.750 mol/L) for pH 3 to pH 10. The interaction of black mass particles with gas bubbles in the AFM-geometry gives information about the likeliness of particle-bubble-attachment and detachment in salt flotation.

The research data consists of two parts:

Part A:

Experimental Atomic Force Microscopy data for the interaction of black mass particles (NMC 622 and spherical graphite (SG)) with sessile gas bubbles in salt solutions.

Part B:

Data for the key figures of "*Forces during film drainage and detachment of NMC and spherical graphite in particle-bubble interactions quantified by CP-AFM and modeling to understand the salt flotation of battery black mass*" are provided as tabulator separated "*.txt" files.

Contents of Part B

Figure	Content
1	AFM topography scans of NMC and spherical graphite
4	Zeta potential of NMC, spherical graphite and gas bubbles (Li 1991 [1]) in 1:1 electrolyte solution
5	Electric double layer disjoining pressure in 1:1 electrolyte solution for NMC-bubble and spherical-graphite-bubble interactions, calculated from the Hogg-Healy-Fuerstenau equation
6	Median force from CP-AFM during the film drainage between a NMC particle and a gas bubble at pH 3 and pH 10 in 1 mmol/L sodium chloride solution compared with the Stokes-Reynolds-Young-Laplace model (SRYL)
7	Pressure in the film between a NMC particle and a gas bubble at points A-D in Figure 6a calculated from the SRYL model
8	Median force between NMC and gas bubbles during film drainage in 0.75 mol/L sodium chloride solutions from CP-AFM
9	Median force between spherical graphite and gas bubbles during film drainage from CP-AFM
10	Trace curves for NMC and spherical graphite interacting with sessile bubbles from CP-AFM

DOI: https://doi.org/10.25532/OPARA-693

11	Particle retraction and detachment of NMC and spherical graphite from gas bubbles in acidic 1:1 electrolyte solutions
12	Three-phase contact line (TPCL) of NMC and spherical graphite during detachment from gas bubbles at acidic pH-values, including three-phase contact angle, inclination of the bubble interface at the TPCL and the opening angle
S1	Hamaker coefficient and disjoining pressure due to van der Waals forces for the interaction graphite-water-air
S2	AFM force-position curves for the particle-bubble interaction of NMC and spherical graphite in 0.705 mol/l a sodium chloride solution with additional 0.001 mol/l sodium acetate buffer solution.
S3	Median trace and retrace curves for particle-bubble interactions with NMC
S4	Median trace and retrace (blue) curves for particle-bubble interactions with spherical graphite
S5	Three-phase contact line (TPCL) of NMC and spherical graphite during detachment from gas bubbles at pH 10, including three-phase contact angle, inclination of the bubble interface at the TPCL and the opening angle

References:

[1] C. Li, P. Somasundaran, Reversal of bubble charge in multivalent inorganic salt solutions - Effect of magnesium, Journal of Colloid and Interface Science, 146 (1991) 215-218, https://doi.org/10.1016/0021-9797(91)90018-4.