Electronic Supplementary Information for

Bubble-Surface Interactions with Graphite in the Presence of Adsorbed Carboxymethylcellulose

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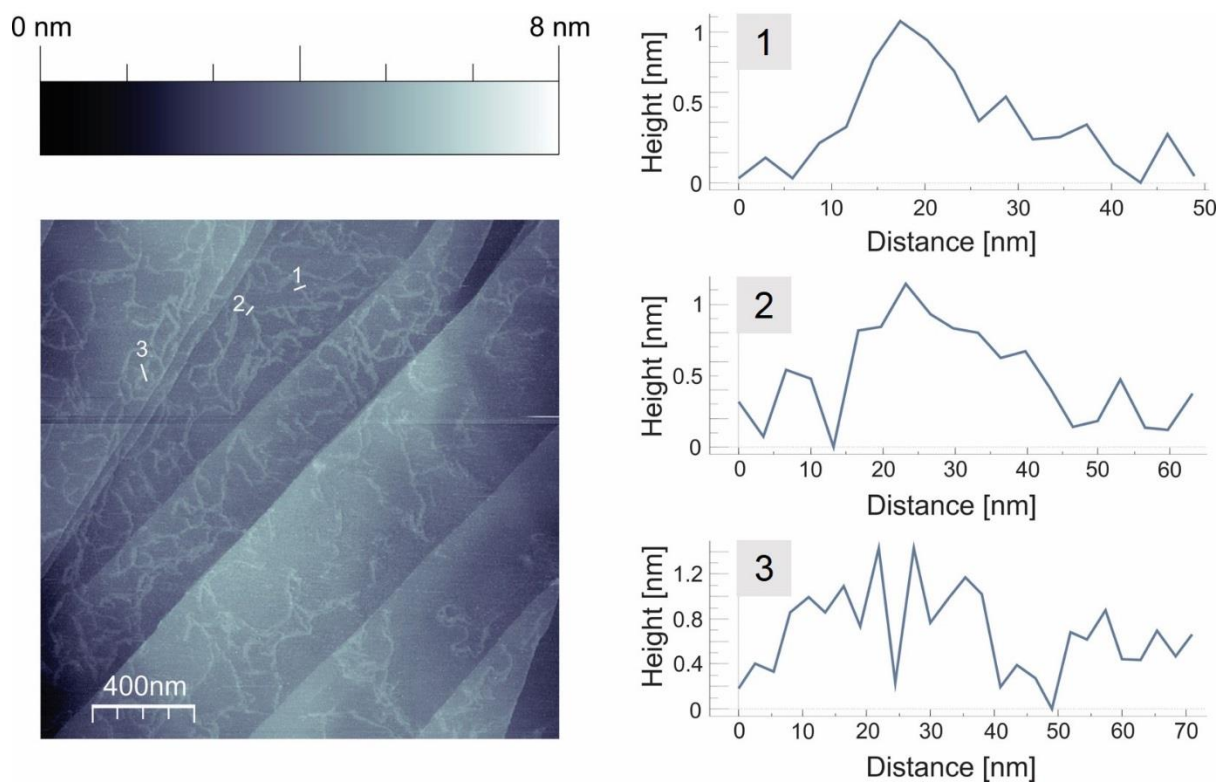
Figure SI 1. Left panel: 2 x 2 μm^2 AFM height image of CMC molecules on HOPG modified with 5 mg·L^{-1} CMC solution in 10^{-3} M KCl at pH 9. Right panel: corresponding height profiles along the cross-sections 1, 2, and 3 as indicated in the AFM height image.
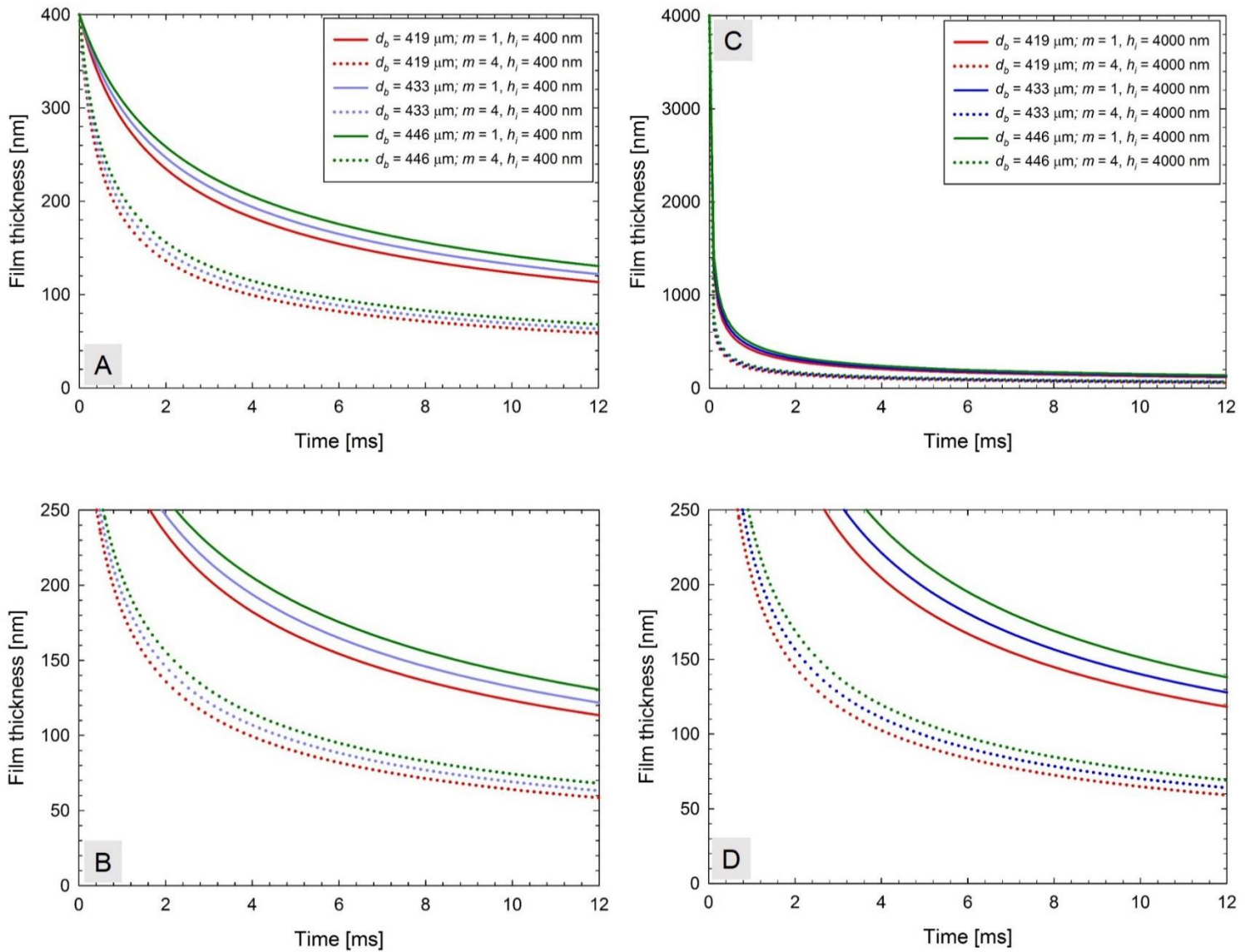
Figure SI 2. The film drainage calculated from Equation (5) for bubble diameters 419 μm (red lines), 433 μm (blue lines), and 446 μm (green lines) assuming no slip ($m = 1$, solid lines) and full slip ($m = 4$, dotted lines) at the solution-gas interface. Plot (A) shows the film thickness versus time calculated for an initial film thickness of 400 nm. Plot (B) is an expanded view of a region in plot (A). Plot (C) presents film thickness versus time calculated for an initial film thickness of 4000 nm. Plot (D) is an expanded view of a region in plot (C).
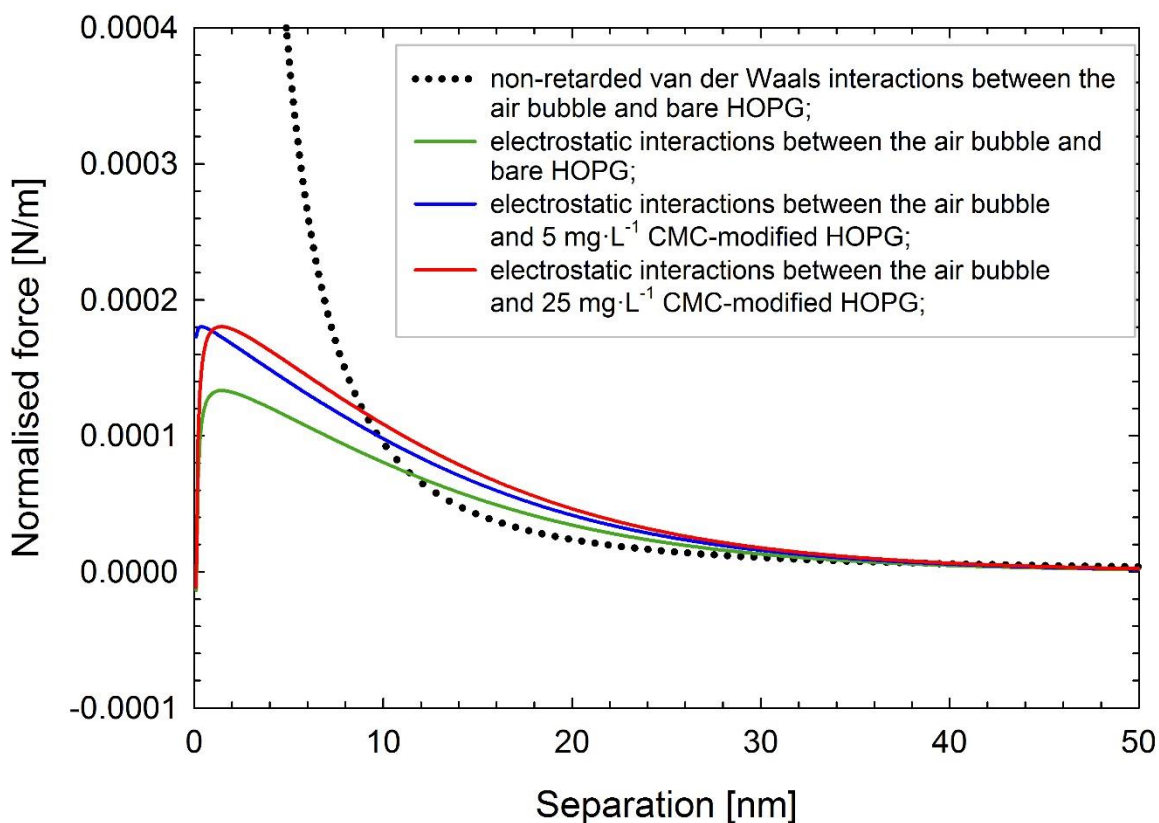
Figure SI 3. The normalized (in respect to bubble radius) interaction forces between an air bubble and HOPG surface. Non-retarded van der Waals interactions (dotted line) calculated for the sphere-flat surface geometry. The Hamaker coefficient used for HOPG-water-air system was: $-5.68 \cdot 10^{-20}$ J [B. C. Donose, E. Taran, M. A. Hampton, S. I. Karakashev and A. V. Nguyen, Adv. Powder Technol., 2009, **20**, 257-261]. The electrostatic interactions for all three systems were computed using constant potential boundary conditions and the Hogg-Healy-Fuerstenau (HHF) approximation. The measured zeta potentials of bare and CMC-modified HOPG surfaces were used in place of surface potentials. Zeta potential for the air bubble was taken as -50 mV [C. Yang, T. Dabros, D. Li, J. Czarnecki, J. Masliyah, J. Colloid Interface Sci., 2001, **243**, 128-135].
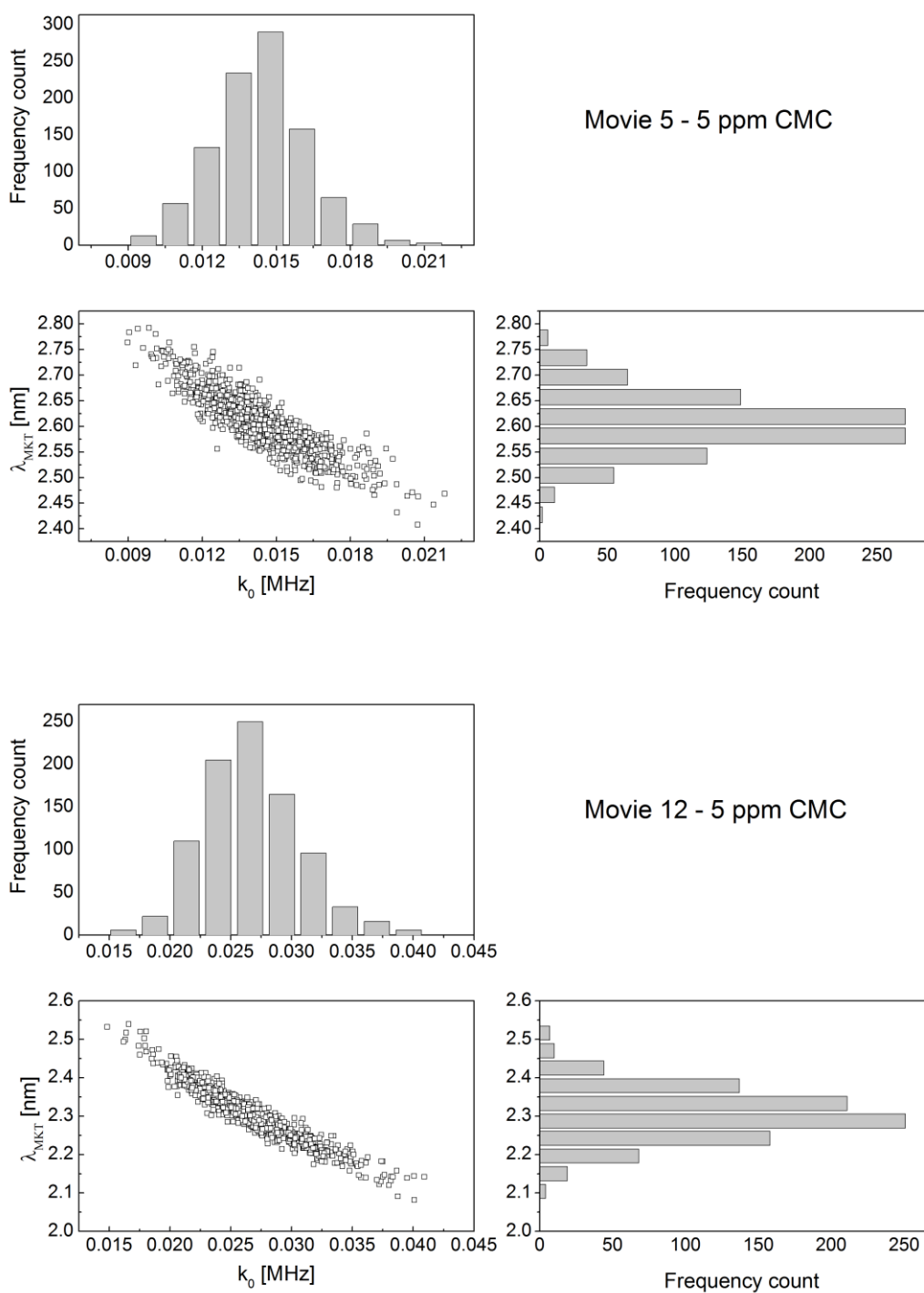
Figure SI 4. Distribution of k_0 and λ parameters determined using G-Dyna software for MKT fits to a bubble-surface collision for HOPG modified by adsorption of CMC from 5 mg·L^{-1} CMC solution in 10^{-3} M KCl at pH 9.
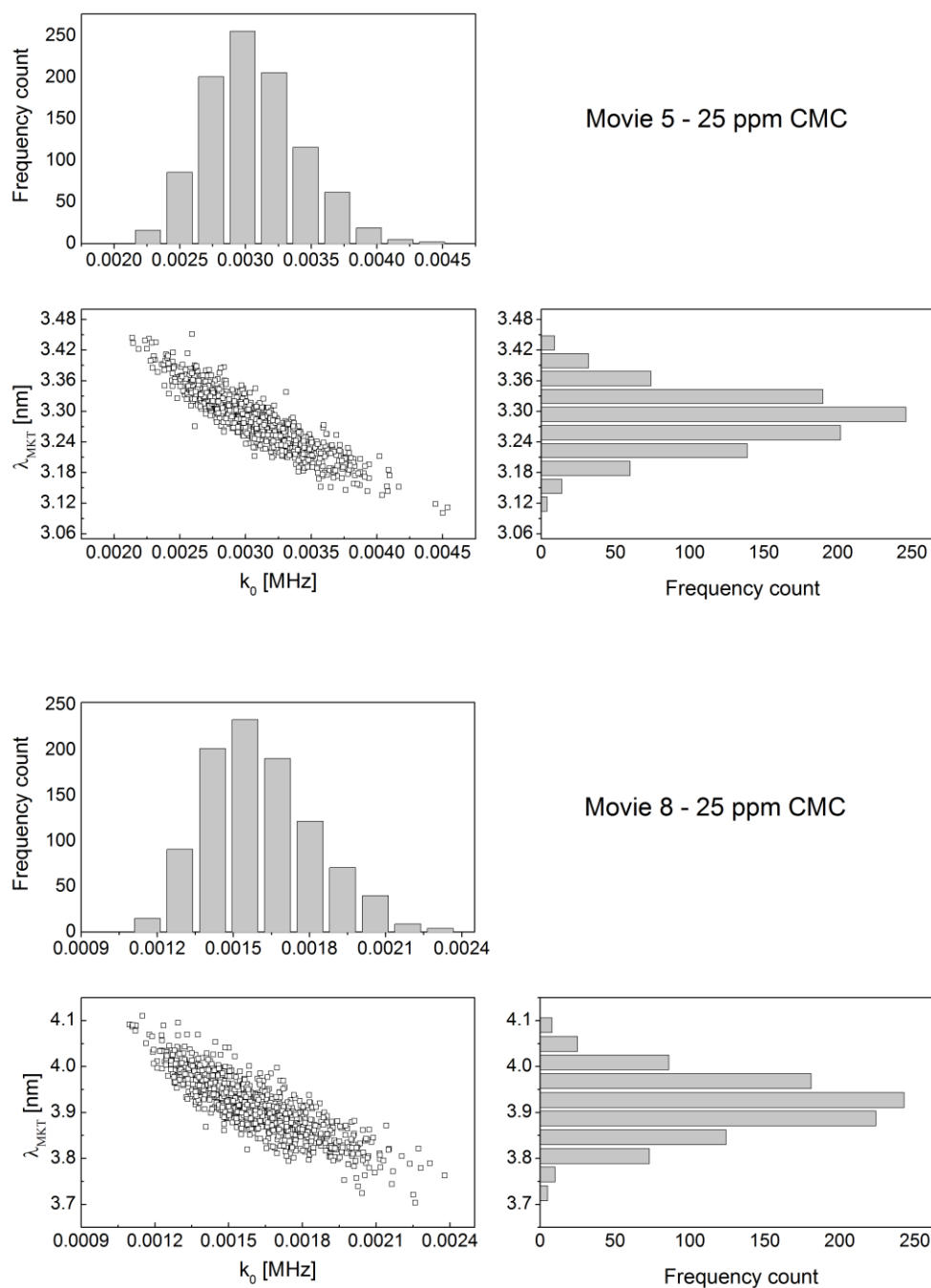
Figure SI 5. Distribution of k_0 and λ parameters determined using G-Dyna software for MKT fits to a bubble-surface collision for HOPG modified by adsorption of CMC from 25 mg·L^{-1} CMC solution in 10^{-3} M KCl at pH 9.