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Propagating Waves of Self-Assembly in Organosilane Monolayers. JACK DOUGLAS, NIST, KIRILL EFIMENKO, NCSU, DANIEL FISCHER, FREDRICK PHELAN, NIST, JAN GENZER, NCSU — Wavefronts associated with reaction diffusion and self-assembly processes are ubiquitous in the natural world. While it often claimed that this type of self-sustaining front propagation is well described by mean field 'reaction diffusion' or 'phase field' models, respectively, it has recently become appreciated from simulations that fluctuation effects can lead to appreciable deviations from the classical mean field theory (MFT) of this type of front propagation. The present work addresses the existence of fluctuation effects in the particular case of the frontal self-assembly of the organosilane self-assembled monolayers on silica-coated surfaces. By following the progress of this self-assembly process via near-edge x-ray absorption fine structure spectroscopy (NEXAFS), we find that these layers organize from the edge of the wafer as a propagating planar wavefront with a well-defined velocity, c. In accordance with two-dimensional simulations of this type of front propagation that include fluctuation effects, we find that the interfacial widths w(t) of these self-assembly fronts exhibit a power-law broadening in time rather than the constant width predicted by mean field theory. Moreover, the observed exponent values accord rather well with previous simulation estimates. This study confirms that fluctuation effects can cause interfacial broadening in autocatalytic front propagation, as found in earlier computations.

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