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Automated Analysis of Time-Dependent Specular Neutron Reflectometry from Thin Films of Polymers Using Neural Networks

Neutron reflectometry (NR) is a unique characterization technique for studying the structure of thin films due to its high spatial resolution, non-destructive nature, and the sensitivity of neutrons to both isotopes and spin. Machine Learning techniques, on the other hand, provide the opportunity to analyze large amount of data and predict outcomes. Here, we combine machine learning and NR data, both experimental and simulated data, in a series of workflows that enable predicting the structural parameters of thin polymer films from NR data, generating NR curves from Scattering Length Density profiles curves (and vice versa), and predicting the time evolution of NR data. As a toolkit, this set of workflows represent a step forward towards facilitating the analysis, interpretation, and prediction of NR signals, paving the road to automatization. In this talk, I will discuss application of these workflows to thin films of ionic block copolymers in applied electric fields.

Topical Area

Soft matter: polymers, and complex fluids

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