Deep Learning-Assisted Spatio-Temporal Modeling of Graphene Oxide Reduction Dynamics for Tunable Bandgap Engineering

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This study integrates deep learning with experimental spatio-temporal data to model and predict electric-field-induced reduction dynamics in graphene oxide (GO) thin films. By combining in situ electrical, optical, and imaging data with deep neural networks, the work establishes a predictive framework for real-time control of GO bandgap modulation. The AI-based model provides insights into the nonlinear interactions among applied electric field, time, humidity, and morphology, enabling autonomous optimization of reduction conditions for tunable bandgap engineering.

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