

MOLECULAR MOTIONS WITHIN SELF-ASSEMBLED MONOLAYERS

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ABSTRACT

Dynamic motions of molecules within self-assembled monolayers (SAMs) of alkylsilane precursors were investigated by broadband dielectric spectroscopy (BDS). The highly-ordered and close-packed nanostructure of SAMs was found to considerably hinder the motions of building block dipoles. Only dipolar endgroups forming the monolayer canopy are able to move under the applied electric field, while silane headgroups are fully constrained due to their rigid covalent binding to the substrate surface. Interestingly, the motion process of endgroups is for the first time observed independently from other overlapping dielectric signals. Further data analyses revealed this mobility as being strongly cooperative due to the tight molecular packing of SAMs and the presence of abundant electrostatic interactions between adjacent polar endgroups.

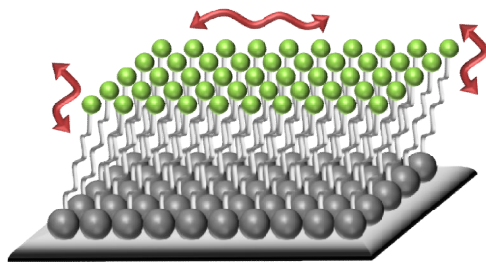


Fig. 1: Schematic representation illustrating the motions of the monolayer canopy.