David Sustr et al., J Biotechnol Biomater 2018, Volume 8
DOI: 10.4172/2155-952X-C1-088

Assessment of Molecular Diffusion in Polyelectrolyte Multilayer Matrix

David Sustr[1,2], Antonin Hlavacek[3], Claus Duschl[2] Dmitry Volodkin[4]

Assessment of molecular di usion is of high importance in elds of drug delivery systems, biomaterial development, cell biology, etc. Assessment and comprehensive analysis of the di usivity provides a deeper understanding of the di usion phenomenon and heterogeneity of biomaterials. is insight eventually may lead to a rational control over the di usivity. Fluorescence recovery a er photobleaching (FRAP) is commonly employed to probe molecular di usion by analysis of the recovery of uorescence a er photobleaching of uorescently labelled molecules. Despite FRAP being a popular method, it is hard to analyze multi-fractional molecular di usion due to limited possibilities of approaches for analysis. Here we present a novel simulation-optimization-based approach (S-approach) that signi cantly broadens possibilities of the analysis. In the S-approach, possible uorescence recovery scenarios are primarily simulated and a erwards compared with a real measurement while optimizing parameters of a model until a su cient match is achieved. is makes it possible to reveal multi-fractional molecular di usion. e proposed S-approach is compared with a conventional, yet advanced analytical solution based approach (A-approach) which involves tting an analytical solution of molecular di usion to FRAP recovery pro les. e S-approach is superior for multi-fractional analysis compared to the analytical one, however, di usion of a single population of molecule

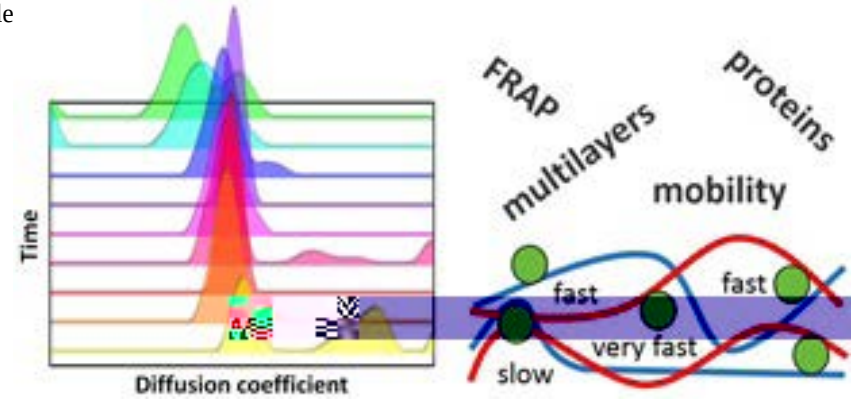

Figure 1: **Le : Distribution of di usion coe cients of cytochrome c loaded into (HA/PLL)24 multilayers. Right: Schematics depicting various interaction states of cytochrome c in polyelectrolyte multilayer and corresponding keywords.**

Recent publications

1. Sustr D, Hlavacek A, Duschl C, Volodkin D (2018) Multi-Fractional Analysis of Molecular Di usion in Polymer Multilayers by FRAP: A New Simulation-Based Approach. e Journal of Physical chemistry B 122,1323-1333
2. Selin V, Ankner JF, Sukhishvili SA (2017) Nonlinear Layer-by-Layer Films: E ects of Chain Di usivity on Film Structure and Swelling. Macromolecules 50, 6192-6201.

3. Xu L, Selin V, Zhuk A, Ankner JF, Sukhishvili SA (2013) Molecular Weight Dependence of Polymer Chain Mobility within Multilayer Films. ACS Macro Lett 2, 865-868.
4. Velk N, Uhlig K, Vikulina A, Duschl C, Volodkin D (2016) Mobility of Lysozyme in Poly(L-lysine)/hyaluronic Acid Multilayer Films. Colloids Surf. B 147, 343-350.
5. Vogt C, Ball V, Mutterer J, Schaaf P, Voegel JC, Senger B, Lavalle P (2012) Mobility of Proteins in Highly Hydrated Polyelectrolyte Multilayer Films. J. Phys. Chem. B 116, 5269-5278.

Biography

David Sustr has an expertise in polyelectrolyte multilayers, diffusion measurements, microscopy techniques and more. He gained these abilities during studies and work at Masaryk University (Czechia), University of Helsinki (Finland), University of Potsdam (Germany), and Fraunhofer IZI-BB (Germany). His motivation comes from an interest in understanding reasons of behavior and its relationships of various systems and materials.

David.Sustr@izibb.fraunhofer.de

Notes: