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THERMODYNAMIC AND DIELECTRIC PROPERTIES OF THE IMMUNE COMPLEXES BETWEEN SPECIFIC ANTIBODY AND SARS-CoV-2 B.1.1.529 SPIKE PROTEIN

Beatričė Urbaitė[1], Silvija Juciutė[1,2], Ieva Plikusienė[1,2]

[1]Faculty of Chemistry and Geosciences, Institute of Chemistry, Vilnius University, Naugarduko 24, Vilnius, Lithuania
[2]State Research Institute Centre for Physical Sciences and Technology, Sauletekio Avenue 3, Vilnius, Lithuania
beatrice.urbaite@chgf.stud.vu.lt

Investigating thermodynamical properties of antibody-antigen immune complex formation is crucial for a deeper understanding of molecular mechanisms involved in immune responses. The ability of SARS-CoV-2 virus to spread is related to the mutation in the structural proteins of the virus. The mutations in the Spike protein are linked to the virus's survival capability, rate of spread, and disease severity [1].

That's why it is very important to understand how immune complex between specific antibodies and mutated Spike protein is formed and what are the thermodynamic properties of such process. In this study we investigated how immune complex of recombinant specific monoclonal antibodies and SARS-CoV-2 Spike protein B.1.1.529 is formed in real time. Hence, the affinity interaction between immobilized specific monoclonal antibodies and SARS-CoV-2 B.1.1.529 (omicron variant) Spike protein was conducted by combining two methods: Spectroscopic ellipsometry (SE) and quartz crystal microbalance with dissipation (QCM-D) simultaneously. These highly-precise, real-time and label-free methods provided real-time kinetics.

In this work the kinetics study was used to calculate thermodynamic parameters of the formation of immune complex, such as association and dissociation rate constants (k_a and k_d), the stable antigen-antibody complex rate constant (k_r) the equilibrium association and dissociation constants (K_A and K_D) and to assess the surface mass density of immune complexes.

[1] Magazine N. et al., Viruses. 2022 Mar; 14(3): 640