A COLORIMETRIC METHOD FOR CHARACTERIZING FAST EXTRACTION PROCESSES IN NADES

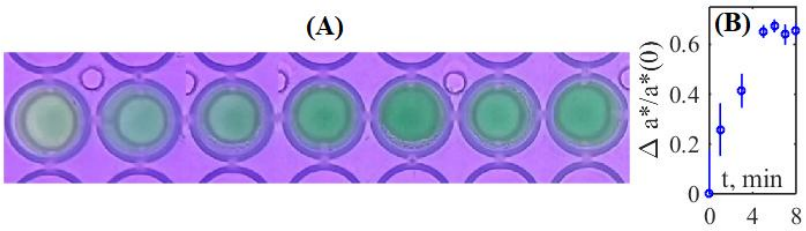
Sychev A.V., Burtzev I.O., Postnikov E.B.
Kursk State University
305000, Kursk, Radishcheva st., 33

In the modern biotechnology industry, natural deep eutectic solvents (NADES) attract significant attention as they provide a route toward the transition to "green" extractants. At the same time, the molecular and thermodynamic background of their efficiency is hampered by the lack of kinetic data explaining the relevant intermolecular interactions. The situation is complicated by the high viscosity of NADES, which necessitates significant water dilution, filtration, and centrifugation of the samples to make them suitable for conventional spectrophotometry. As a result, this approach provides only overall yield data rather than enabling real-time monitoring.

In this work, we propose an alternative method based on a colorimetric approach that processes a time series of samples during short extraction periods. As a case study, the extraction of phycocyanin from *Arthrospira platensis* biomass in a NADES system composed of glycerol and glucose is examined, see the figure below. The key feature of the method is the monitoring of color trajectories in the device-independent CIE Lab* color space under specially developed illumination, filtered in accordance with the specific molecular absorption bands of the compounds involved.

The figure below illustrates that the developed colorimetric approach effectively overcomes the analytical challenges posed by the high density and viscosity of eutectic solutions based on sugars and polyhydric alcohols.

Based on the kinetic parameters obtained during the extraction process for this and several other NADES, the implications of the identified interplay between the thermodynamic properties of NADES and their biochemical interactions with plant tissue components will be discussed.



(A) Example of a solution's recorded color change during ten minutes from the beginning of extraction in NADES. (B) Kinetic extraction curve calculated coloimetrcally from these images.