NAHID MAGHSOUDI
Shiraz University,
Iran

Applying different potential waveforms to ionic species mass transport in xylem/phloem vessels of fig tree via controlling the water potential

Abstract:

Osmosis pressure inside tree's xylem and phloem vessels is a normal process causes organic/inorganic water-soluble fluids transfer along a tree as a nutrient agent. Inspiration to the nature, a novel xylem/phloem-based bio-separator/ transporter as a lab-on-a vessel system is introduced. Briefly, the two sides of a fig stalk (dimeter: 1.0 ± 0.1 cm, length: 2.0 ± 0.1 cm) was introduced to two feeding and receiving containers. The system was based on electrical stimulation using three-graphite electrodes, as the working, counter and the pseudo-reference electrodes. This resulted in having voltage triggering the xylem/phloem vessels during controlling the water splitting and management of the migration process, based on the water potential. The harmony of the applied electrical potential waveform with the water potential caused the xylem/phloem vessels and water medium to act as the solid phase and transporting phase, respectively. For this purpose, K+ and Cl- standard solution with 1.0 mg. L-1 concentration was utilized as selected probe for the optimization purpose. Based on a comparative study, a sin(t) electrical potential wave with characteristics of 2.70 ± 0.05 kHz (n=10) and a voltage amplitude range of 0.0-1.0 kV (vs. the total applied potential) provided a noticeable sensitivity. The specific potential for each ion was estimated via measuring the electrical current and/or electrochemical conductivity. Acceptable transport efficiency and correlation coefficients (R2> 99 %) and a reproducibility of %3.15 (n=10) was obtained. This system was an applicable, simple and inexpensive low voltage bio-device comparable to the introduced systems such as capillary electrophoresis.

Biography

Nahid Maghsoudi received her Ph.D. degree in Analytical Chemistry from Shiraz University, Iran, 2022. She passed her sabbatical leave at Sapienza University of Roma, Italy. She has worked on plant separation and detection with HPLC, and TGA blood analysis in Italy. She is currently working as research fellow in FCCC Company, Shiraz, Iran. She is the author of a research publication and 1 invention in designing instrument. Her research interest includes manufacturing novel applicable instruments, bio-based material or substrates, microstructure of material construction, Ni and Ni-Sn, Nikasil alloys electroplating. She has worked on the supported projects.