

Epitachophoresis – Theoretical and practical considerations

Ivona Voráčová¹, Jan Příklad¹, Jakub Novotný¹, Vladimíra Datinská², Pantea Gheibi², Jan Berka², Yann Astier², Bohuslav Gaš³, **František Foret^{1*}**

¹ *Czech Academy of Sciences, Institute of Analytical Chemistry, Brno, Czech Republic*

² *Roche Sequencing Solutions, Inc., Pleasanton, USA*

³ *Charles University, Prague, Czech Republic*

Gold statement

- Learn about epitachophoresis
- Understand the challenges and benefits using this new concentration/separation technique

Introduction

Many clinical and diagnostic applications require high-quality nucleic acids preparations. The most common nucleic acids isolation techniques exhibit inherent limitations, concerning quantitative results. In recent years, there is an increasing interest in sorbent free alternatives.

Body

In this communication, we report on a new instrumental system for processing the crude samples by discontinuous electrophoresis – epitachophoresis with theoretically unlimited concentration factor. The laboratory constructed device was designed in a flat arrangement where sample zones migrated towards a fraction collection well. This allowed focusing of 15 ml sample volumes in a 110 mm device in less than 1 hour or, in the case of a smaller device processing of a 1 ml sample could be finished in few minutes. The position of the migrating zone was monitored by laser-induced fluorescence or surface conductivity detectors. The experimental findings were confirmed by theoretical descriptions using computer modeling. Several experimental parameters have been studied including the size, shape, and size of the zone stabilizing media and devices for large sample volume as well as miniaturized 3D printed devices have been prepared and tested.

Conclusion

In conclusion, we have developed a simple, preparative method for DNA concentration and purification allowing us to process ml sample volumes. In the discontinuous electrolyte system, the sample enrichment factor is limited only by the device geometry, and devices for large sample volumes as well as miniaturized devices can be easily prepared.

References

[1] F. Foret et al., *Anal. Chem.* 2019, 111, 7047-7053.