

Electrophoretic mobility of branched macromolecules

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Gold statement

- Learn about branching in starch from iodine-affinity CE
- Learn about branching in polyacrylates from free-solution CE
- Use distribution of electrophoretic mobilities to characterise branched polymers

Introduction

The interest in CE of macromolecules, especially polysaccharides and synthetic polymers, is growing in a range of fields of research and applications. Starch (in rice, bread, pasta, etc.) is one of the main sources of energy for humans but its characterisation is a lot less advanced than that of other biomacromolecules such as DNA or proteins. Poly(acrylic acid) is an important industrial polymer with new applications researched for example for controlled drug delivery or antibacterial films. Poly(acrylic acid) typically contains short and long-chain branches but little is known about the length or position of these branches.

Body

Starch is not soluble in common solvents used in CE, but is soluble in DMSO. Starch is not charged in DMSO but can be charged through binding to iodine. Based on the CE of starch presented in [1], we were able to determine the distributions of electrophoretic mobilities of starch (including rice starch). This allows us to study both iodine binding to starch as well branching in starch. UV spectroscopy of iodine-starch complex is an important characterisation method for the food industry or breeding programs like rice breeding programs.

We have shown that free-solution CE can separate poly(acrylic acid) based on structure, especially branching [2]. We have also shown that distributions of electrophoretic mobilities allow a unique characterisation of the heterogeneity of branching in poly(acrylic acid) [3]. We will discuss the influence of short- and long-chain branching on electrophoretic mobilities.

Conclusion

Distributions of electrophoretic mobilities can be determined using iodine-affinity CE (starch) or free-solution CE (polyacrylates). They show that the branched structure of starch may be more complex than currently taught. They yield unique information complementary to UV spectroscopy (for starch), or to NMR spectroscopy or Field-Flow Fractionation in general.

References

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