

# **MULTI-DETECTOR THERMAL FIELD-FLOW FRACTIONATION (THFFF) AS A CHARACTERIZATION TECHNIQUE FOR COMPLEX POLYMER SELF-ASSEMBLIES AND LARGE AGGREGATES**

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## **ABSTRACT**

Amphiphilic block copolymer micelles have found a niche in pharmaceutical, electronics, environmental, cosmetics and hygiene industries. These micelles, whether in the pure or mixed micelle form, often exist as multiple morphologies (spherical, cylindrical, worm or vesicular) in equilibrium with each other. However none of the current techniques can successfully separate and characterize these multiple morphologies with regards to size, molar mass, chemical composition and their respective distributions, in a single measurement. Thermal field-flow fractionation (ThFFF) is shown to be capable of separating and characterizing pure micelles prepared from two types of polystyrene - polyethylene oxide block copolymers (PS-PEO), of different PS block sizes but similar PEO block sizes. Moreover, multiple micelle morphologies induced by the addition of 1 mM LiBr, as well as multiple mixed micelles prepared from various binary blending protocols of the two PS-b-PEO copolymers were successfully characterized. In addition, ThFFF is shown to be capable of monitoring the dynamics of formation of the mixed micelles.