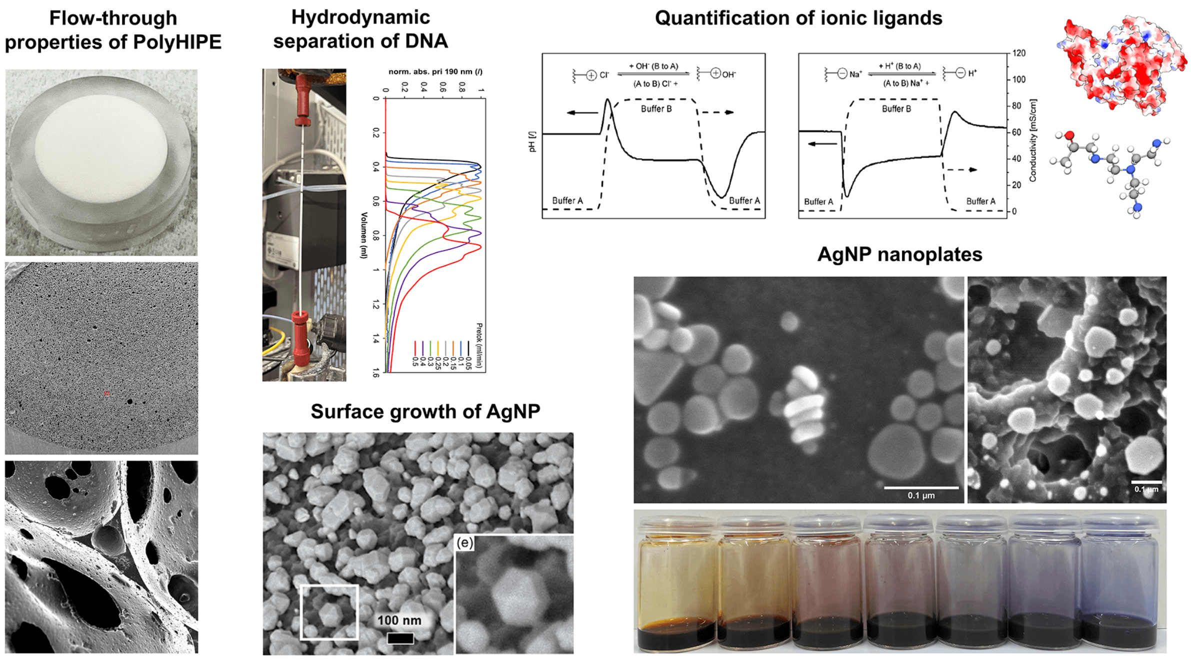
Abstract

This work focuses on the synthesis of a porous flow-through material for studying reactions. A polymer template from a high internal phase emulsion is used. Different porosities were explored assessing their effects on the pressure drop. The homogeneity of flow was assessed in advance to ensure unbiased results. Comprehensive flow characterization techniques were combined for detailed material testing.

With confirmed adequate flow properties, the material was applied in various contexts. Aqueous solutions were used to modify surface chemistry. Modified polymers with altered surface chemistry were used to investigate the pH transition method to determine surface-bound ionic groups. Chelating agents were introduced to broaden the range of chemicals studied, including protein A. The results supported the versatility of the flow-through pH transition method for the quantification of ionic ligands.

Promising outcomes prompted us to investigate the polymer as a silver-based catalytic reactor. Two approaches were pursued: in-situ crystal growth and immobilization. In-situ growth resulted in high silver loading and almost complete surface coverage, while immobilization provided a generalizable method for well-dispersed nanocrystals. Both reactors were investigated for the catalytic conversion of 4-nitrophenol.

Finally, separation by slalom chromatography using extended polymer capillary columns was studied. The dissertation highlights various applications and emphasizes the value of the investigated materials for the scientific community.



Graphical abstract