



## **Synthesis and Characterization of Well-Defined Polypeptide Brushes**

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Polypeptide brushes can potentially be applied as multiple-antigen peptides, gene carriers, or MRI contrast agent carriers. Previous methods for brush synthesis involved multiple reactions and tedious purification steps. We are trying to develop a new methodology to prepare well-defined polypeptide brushes utilizing different selectivities of two novel transition metal initiators developed in this group. This method begins with the polymerization of  $\alpha$ -amino acid N-carboxyanhydride to build the brush backbone, from which another amino acid monomer can be grafted. In contrast to previous methods, this approach will minimize purification steps while allowing control over chain length and chain length distribution, as confirmed by our preliminary results. Gel permeation chromatography (GPC) characterization confirmed the synthesis of the homopolymer and polypeptide brushes with a narrow molecular weight distribution. The GPC confirmed the formation of polypeptide brushes with definite branch length. Problems arose in controlling the molecular weight of the homopolymer, possibly due to impurities from starting materials. We attempted to purify the monomer using flash column chromatography, using nuclear magnetic resonance (NMR) to characterize the resulting fractions. NMR results showed successful purification of the monomer used for polypeptide brush synthesis. We used atomic force microscopy to visualize obtained poly(L-lysine) brushes, finding that they form elongated, spindle-like nano-objects which are consistent with the approximated size of brushes. These initial results suggest that this synthetic method is viable for creating brush polypeptides or copolypeptides. With further optimization, this method may be used to synthesize branched polypeptides of a well-defined length using transition metal initiators.

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