Chain Growth Kinetics of Conjugated Polymers on Ferromagnetic Nanoparticles Investigated by SANS

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Ferromagnetic nanoparticles have shown promising applications in water treatment due to their large surface area, high reactivity, stability and reusability. However, their dissolution in aqueous environment greatly diminishes the usability as photocatalysts. Coating of conductive polymers on the surface of photocatalysts can reduce the dissolution without compromising the material's photocatalytic properties. In this work, polypyrrole (PPy) and polyaniline (PANI) were coated on the surface of two magnetically separable MoO3/Fe3O4 nanocomposites with different surface chemistries. We used small-angle neutron scattering (SANS) technique to in situ monitor the polymerization kinetics by taking advantage of neutron's sensitivity on light elements. The scattering results reveal that PPy polymerization initiated faster yet had a slower rate than PANI. This study shows that the polymerization of PPy was more affected by the base material properties than PANI.s. The ultimate size of polymer chains grafted on nanoparticles largely depended on the monomer concentration and the surface properties of the nanoparticles. These observations provide valuable insights on the polymerization mechanisms of two conjugated polymers on the surface of nanocomposites.