Coordination-Driven Self-Assembly on Polymer Substrates for Efficient Synthesis of $[Au(SPh)]_n$ Coordination Polymer-Based Films

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Recently, increasing efforts have been devoted to the preparation of coordination polymers (CPs) with specific optical and electrical properties because of the development of flexible, lightweight, and portable solid state optoelectronic devices with high efficiency. In spite of significant advances in the research of 3D CPs-based thin films, all approaches for fabricating low-dimensional (1D or 2D) CPs practically rely on the layer-by-layer approach. Therefore, facile synthetic approaches to fabricate thin films of CPs on flexible substrates are in significant demand, such as the in situ one-pot synthesis of CPs on substrates under mild reaction conditions.

This approach involves the adsorption of Au ions into nylon substrate, a sequential reaction with reduction of Au(III) ions, and complexation of Au(I) ions and SPh at the interface between the nylon surface and the reaction solution containing only thiophenol (HSPh) molecules (***Figure***). $[Au(SPh)]_n$ CPs with high crystallinity can be formed directly on the nylon substrate using this approach. In addition, we demonstrate that initially formed amorphous $[Au(SPh)]_n$ aggregates are transformed to crystalline $[Au(SPh)]_n$ CPs through the rearrangement of components during the reaction. Our study not only provides fundamental aspects of the crystal formation of CP on the substrate but also a pathway toward formation of continuous free-standing CP crystal films; this was achieved via the control over growth kinetics.

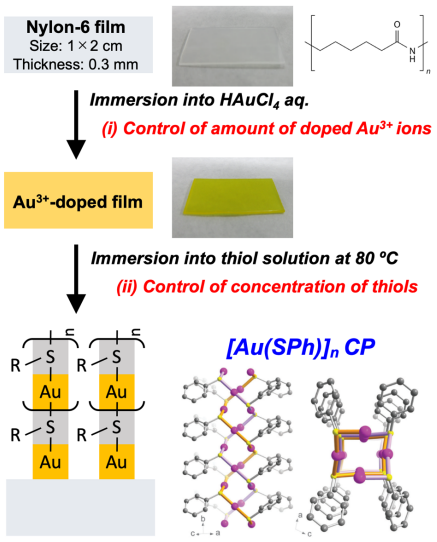

Figure. Schematic illustration of the developed interfacial approach for formation of $[Au(SPh)]_n$ CPs on a substrate.

1) T. Tsuruoka et al., *Cryst. Growth Des.* **2020**, *20*, 1961-1968.