# Engineering advanced materials through polyphenol-mediated assembly

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The development of rapid and versatile coating strategies for interface and particle engineering is of widespread interest [1]. This presentation will focus on our studies on the formation of a unique class of metal–organic materials, metal–phenolic networks (MPNs). MPNs can be formed on various substrates by simply coordinating polyphenols and metal ions through self-assembly [2,3]. This robust assembly strategy is substrate independent (covering organic, inorganic, and biological substrates) and has been used for the preparation of various materials, including thin films, particles, superstructures and macroscopic assemblies. It will be shown that a range of polyphenols and a library of metal ions are suitable for forming MPNs. The MPN materials are stable at physiological pH but disassemble at acidic pH, thus making them of interest for the intracellular release of therapeutics. By altering the type of metal ions, different functions can be incorporated in the MPN materials, ranging from fluorescence to MRI and catalytic capabilities. Furthermore, synthetic polymer–phenol conjugates have been used as building materials to control the biofouling properties of the MPN materials. Examples of self-healing MPN gel materials [4] and engineered protein-based nanoparticles [5] will also be highlighted. The ease and scalability of the assembly process, combined with the tunable properties of MPNs, provide a new avenue for functional interface engineering and make MPNs potential candidates for biomedical, environmental, and advanced materials applications.

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