List of RGJ advisors 2020/2021

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Summary of research:

Title: Bio-based molecularly imprinted polymers as stationary phase for chromatographic separation of pesticides

Pesticide residue analysis is becoming one of the most active directions in the field of analytical chemistry. At present, the modern analytical techniques for pesticide detection usually involve chromatographic techniques. The key to chromatographic separation is a sustainable retention and elution process. Choosing the appropriate columns, whether commercial or under development, could be somewhat confusing for the analytical chemists. Because of the pesticide components and their contents in different samples are very different, therefore, modification of analytical conditions depends on types of pesticide residue active ingredients in such interested samples. This research project aims to develop novel stationary phases, based on molecularly imprinted polymers (MIPs), for selective separation of pesticides and overcome the lack of existing columns.

Generally, molecularly imprinting technology is based on the formation of a complex between a target (template) molecule and a functional monomer in the presence of a large excess of cross-linking agent through covalent or non-covalent interactions. After template removal, specific recognition sites complementary in shape, size and chemical functionality to the template molecule are left behind within the polymer. However, MIP preparation based on conventional strategies required large amount of organic or toxic solvents, time-demanding, energy-consuming which end-up in contradiction with the green chemistry viewpoints. To solve these problems, molecularly imprinting technology based on green chemistry principles are applied in the development of novel MIPs. Based on a green synthesis strategy, in this project, biocompatible functional monomer, natural cross-linker, and water as green porogenic solvent will be introduced in MIP preparation process to reduce usage of toxic chemicals and waste prevention. To the best of our knowledge, there is no literature of bio-based MIP as a stationary phase for selective separation of pesticides in real samples. Therefore, biodegradable MIPs in this work would provide a selective and environmentally friendly method to determine the target pesticides.