Small Molecule Organic Glass Scintillators for Radiation Detection

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Abstract:

Often used for radiation detection, scintillators emit light when they interact with ionizing radiation. The fluorophores in these scintillators are responsible for the light emission and they tend to consist of aromatic rings. Solid-state organic scintillators come in several forms. Plastics have highly desirable mechanical properties and are easy to fabricate, while crystals like stilbene are difficult to produce even though they exhibit excellent scintillation performance. A promising new material is organic glass scintillators (OGS), which can have performance competitive with organic crystalline scintillators, and an ease in production that rivals plastics. OGSs can also efficiently differentiate between neutron and gamma radiation through pulse-shape discrimination (PSD). This is important in determining when there is a legitimate threat since the gamma radiation from a container of bananas, avocados or granite could set off scintillators leading to costly and time inefficient false positives. However, current state-of-the-art OGSs are quite brittle and tend to have low glass transition temperatures which would affect their usefulness in the real world. Additionally, the current approach for preparing OGS includes a n-butyl lithium step, which is an extremely reactive and pyrophoric material. This poster will present and discuss relatively simple palladium catalyzed cross-coupling and alkylation chemistry to create OGS materials that are less brittle with tunable thermal properties for radiation detection applications.