TOWARDS A CONTROLLED AND ATOM EFFICIENT SYNTHESIS OF SEMICONDUCTING POLYMERS

Christine K. Luscombe,[a,b,c] Sabin-Lucian Suraru[a,b]

[a]Department of Materials Science and Engineering, University of Washington, Seattle, WA 98195, USA, E-mail: luscombe@u.washington.edu
[b]Molecular Engineering and Sciences Institute, University of Washington, Seattle, WA 98195, USA.
[c]Department of Chemistry, University of Washington, Seattle, WA 98195, USA.

ABSTRACT

Π-Conjugated small molecules, oligomers and macromolecules are being used in the fabrication of a wide variety of organic electronic devices such as organic field-effect transistors (OFETs), organic photovoltaic (OPV) devices, and organic light-emitting diodes (OLEDs). Efficient syntheses involving fewer steps, fewer toxic reagents and highly-reactive compounds, are needed to lower the cost of materials in a manner that is fundamentally more eco-friendly. Additionally, synthetic approaches for πi-conjugated materials with more functional group tolerance are desirable to expand the range of properties that can be realized in such materials. Developing new synthetic routes to materials can both broaden the scope of science that can be explored, and increase the probability that interesting materials can be developed in an economically viable manner for inclusion in consumer products. One such synthetic strategy that can impact all of these issues is carbon-hydrogen bond activation and subsequent carbon-carbon bond formation (C-H functionalization).[1] While the C-H functionalization represented by direct arylation-based methods are not as developed as the widely-used Stille and Suzuki methods at this stage, they allow for the use of non- or less-halogenated aromatic substances and can negate the need for toxic organotin reagents. They also hold promise of allowing for the synthesis of previously inaccessible materials. In this talk, advances in preparation of versatile π-conjugated small molecules and macromolecules via transition metal catalyzed direct arylation, and the scope, limitations and challenges for materials science will be presented.

Acknowledgement: This work was supported by the NSF under the CCI Center for Selective C–H Functionalization, CHE-1205646.

References:

[1]Okamoto, K.; Zhang, J.; Housekeeper, J. B.; Marder, S. R.; Luscombe, C. K. *Macromolecules*, **2013**, *46*, 8059–8078.