**[Optimization of direct arylation polymerization for the synthesis of low bandgap thieno[3,4-b]pyrazine-acceptor copolymers](https://acs.digitellinc.com/acs/live/22/page/677/3?eventSearchInput=&eventSearchDateTimeStart=&eventSearchDateTimeEnd=&eventSearchTrack%5b%5d=201" \l "sessionCollapse393971)**

[*Evan W. Culver*](https://acs.digitellinc.com/acs/live/22/page/677/3?eventSearchInput=&eventSearchDateTimeStart=&eventSearchDateTimeEnd=&eventSearchTrack%5b%5d=201) *and*[*Seth Rasmussen*](https://acs.digitellinc.com/acs/live/22/page/677/3?eventSearchInput=&eventSearchDateTimeStart=&eventSearchDateTimeEnd=&eventSearchTrack%5b%5d=201)

*North Dakota State University*

As the demand for new materials in organic electronic devices (photovoltaics, field effect transistors, etc.) continues to grow, the routes by which these materials are synthesized becomes increasingly important in order to maximize their utility. This also brings a need for these procedures to become increasingly green in terms of the reagents used, the amount of waste produced, and the total number of synthetic steps. For conjugated polymeric materials, a current synthetic method that has shown promise in all these aspects is direct arylation polymerization (DArP). DArP has shown significant improvements over Stille, Suzuki, Negishi, Kumada, and Grignard metathesis by removing the need for stoichiometric quantities of reactive main group elements prior to cross-coupling, limiting the amount of toxic byproducts and waste, and reducing the overall number of steps in the reaction sequence. 2,3-Alkyl functionalized thieno[3,4-*b*]pyrazine (TP) has been shown to be an excellent candidate in the synthesis of alternating copolymers via DArP due to the existence of only two C-H bonds available for activation, which are also suitably acidic. When paired with other acceptors, TP produces remarkably low band gap (Eg) copolymers as low as 0.97 eV. This level of bandgap reduction is on the scale of some of the lowest Eg via alternating donor-acceptor copolymers to date and provides evidence of the significant electron-donating capabilities of the TP unit. This presentation will outline the modifications of DArP required to produce low Eg TP-acceptor copolymers, while highlighting that these conditions can be applied to a variety of dibromo-acceptor precursors without additional adjustments. Additional specifics such as solubility enhancement due to side chain tuning and the resulting physical and electronic properties of the polymers produced will also be discussed.

