

Principal Investigator: Frieder Jaekle

Title: Organoborane Polymers in Catalysis and Supramolecular Materials Chemistry

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The development of ‘smart’ and sustainable materials and chemical processes presents an important frontier in the 21st century. In this 4-year NSF grant entitled “*Organoborane Polymers in Catalysis and Supramolecular Materials Chemistry*”, Prof. Jaekle and his team at the Newark campus of Rutgers University address these challenges by pursuing organoborane polymers in applications where costly and oftentimes toxic transition metals have thus far played a dominant role. In one direction they develop polymeric Lewis acids and ‘frustrated’ Lewis pairs (FLPs) as supported catalysts. The polymers are investigated in metal-free catalytic processes that further benefit from their reusability. A second direction focuses on the preparation of organoborane polymers as building blocks of ‘smart’ materials. When combined with Lewis base-functionalized polymers they reversibly form classical Lewis pairs as crosslinks to generate functional materials that can be readily reused or reshaped when applying an external stimulus. As an example, new elastomers are developed that can be readily recycled at elevated temperatures but also change their color when physically extended, allowing for naked observation of mechanical stress prior to material failure. This principle has been demonstrated in an already highly cited publication entitled “*Lewis Pairs as Highly Tunable Dynamic Cross-Links in Transient Polymer Networks*” in the *Journal of the American Chemical Society* (<https://dx.doi.org/10.1021/jacs.9b07452>).