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Empowering Ideas

Fluorinated building blocks for organic synthesis and macromolecule synthesis

Brief Description

Synthesis of trifluoromethylated alkylboron compounds and incorporation into small molecules and macromolecules

Inventor

Gary A. Molander, Hirschmann-Makineni Professor of Chemistry and Department Chair

STATE OF DEVELOPMENT

- Proof-of-concept

INTELLECTUAL PROPERTY

UP application (US20160002270)

REFERENCE MEDIA

Ryu D. et al. Chem. Eur. J., 2016, 22, p. 120-133.
Molander G.A. and Ryu D. Angew. Chemie, 2014, 53(51), p. 14181-14185.
Argintaru O.A. et al. Angew. Chemie, 2013, 52(51), p. 13656-13660.

DESIRED PARTNERSHIPS

- License
- Co-development

LEARN MORE

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Problem

Fluorinated macromolecules are widely utilized in industry, with the most notable example being Teflon, or perfluorotetrafluoroethylene (PTFE). Additionally, methods for incorporating CF_3 into small organic molecules are not well developed, but are needed to expand the chemical repertoire for fluorine incorporation into pharmaceuticals, agrochemicals, and materials.

Solution

Researchers in the Molander laboratory have developed a metal-free synthetic route to incorporate CF_3 groups and other fluorinated alkyl chains into small molecules as well as macromolecules using organoboron intermediates to generate newfound, polyfluorinated entities. These organoboron building blocks are bench-stable, with indefinite shelf-life. The synthetic methods developed allow the introduction of CF_3 at sp^3-hybridized centers via a novel carbon-carbon bond connection.

Advantages

- Low surface tension and coefficient of friction
- High chemical and thermal stability
- More readily soluble than existing fluoropolymers
- Excellent dielectric properties
- Physical properties potentially superior to Teflon / PTFE
- Biodegradability

Applications

- Non-stick coatings
- Lubricants
- Surfactants
- Wirings
- Composites
- Bench-stable, trifluoromethylated building blocks for pharmaceutical and agrochemical applications