Bio Studio

Green Chemistry Challenge

To develop a scalable platform for the sustainable production of drop-in or performance-enhanced molecules that match or exceed capabilities of energy-intensive equivalents, to achieve cost-parity at commercial scale.

The core problem

Current sustainable alternatives fail to match the performance metrics or cost parity of existing conventional chemicals. Few are true 'drop in' solutions, creating barriers to adoption across supply chains. As global pressure increases for industry to decarbonize, there is a critical need for scalable, high-performance, economically viable replacements that can be integrated into processing methods without the need for new infrastructure.

Why Green Chemistry?

We believe that harnessing the power of Green Chemistry and focusing on the most resource intensive and highest carbon emitting materials will minimize our impact on the planet and reduce carbon emissions, to provide urgently needed, advanced, high-performing solutions.

Case Study: Replacing Silicones

The chemical industry is a significant source of greenhouse gas emissions, largely due to its dependence on fossil-based feedstock. As demand intensifies for sustainable, scalable, and cost-effective alternatives, the need for solutions that meet strict performance standards has never been greater. BII is calling for innovative projects to develop next-generation, sustainable, high-performance chemicals, including alternatives to petrochemicals widely used in materials such as silicones.

Rethinking Silicones: Balancing Performance and Sustainability?

Silicones are ubiquitous in our daily lives, prevalent in products including shampoos and conditioners to medications and prosthetics. Originating from quartz (silicone dioxide), one of the most common elements in the Earth's crust, it is transformed via a highly energy intensive process into volatile flexible liquids (named D4, D5 and D6) that offer a unique sensory profile maintained in formulation.

Volatile silicones are valued for their exceptional thermal stability, chemical inertness, bio-compatibility, emulsifying properties, and ability to polymerize into diverse formulations - from providing smoothing shine in hair products to acting as an excipient in medicated creams. However, volatile silicone's persistence in the environment and tendency to bio-accumulate have led to their classification as substances of very high concern. Additionally, the production process of volatile silicones is energy intensive, relies on non-renewable earth elements, and results in a net increase in CO_2 emissions.

In response, the EU is moving to ban volatile silicones from cosmetic, medical, and certain industrial applications over the next decade. Despite this, no current alternative matches silicones in performance, cost, scalability, and sensory feel. The cosmetics and personal care industry has explored alternatives such as alkanes, esters, and hydrogenated plant oils. However, challenges like visible soaping, unwanted greasiness, and lack of the luxurious sensory feel consumers expect have prevented these options from delivering the same performance as volatile silicones.

The Future Beyond Silicones: A Call For Green Innovation

As regulations evolve, the need for high-performance, sustainable alternatives to silicones has never been more urgent. This is a clear call to action for innovators in the green chemistry space — to re-imagine the molecular foundations or production methods of these materials and develop next-generation solutions that deliver on both performance and planetary health, focusing on desirable sensory properties that prioritize formulation versatility and lower surface tension. **For scientists and entrepreneurs ready to lead that transformation, this is the moment to act.**

Read our Green Chemistry Challenge

The Bio Studio Program

- Duration: Up to 3 years
- Funding: up to 5.35M DKK per year
- Location: BII, Copenhagen, DK

Deadline for Expression of Interest
November 30, 2025

Learn More

Visit our website for details on the Green Chemistry Challenge Call and application process: www.bii.dk/bio-studio

Interested In Applying?

Reach out to Senior Associate, Taylor Cooney
biostudioprogram@bii.dk

BII BioInnovation Institute