

GlycoMIP Guest Lecture

Speaker: Natnael Behabtu

When: Monday, March 7, 2022, 1:00-3:00pm

Where: Steger Hall Auditorium

ENZYMATIC POLYMERIZATION ROUTES TO SYNTHETIC-NATURAL MATERIALS

Natnael Behabtu – IFF, Health & Biosciences

ABSTRACT

Sustainability is becoming a key driver for product differentiation, and corporations around the world are setting specific sustainability metrics on new products. Greenhouse gas emissions (GHG), land and water use, renewable feedstocks and product end-of-life are thus becoming the metrics to assess products' environmental and societal impact. Within this framework, current commercial polymeric materials are showing their limitations and warranting the need for novel material development. A new emphasis on natural materials with the design flexibility of synthetic material is emerging to address these needs. Polysaccharides are a class of natural polymers that need a renewed focus given their large design space and rich functionality combined with intrinsic sustainability. Yet, being mostly extracted from natural feedstock, current industrial polysaccharides such as cellulose and starch lack the purity and molecular design precision found in synthetic polymers. Enzymatic polymerization of polysaccharides is one technology that can address some of the current limitations by using synthetic polymerization approaches. This technology enables both the synthesis of known polysaccharides with a higher purity and precise polymer structure as well as the synthesis of hard to extract polysaccharides such as alpha-1,3-glucans. Moreover, the bottom-up assembly of insoluble polysaccharide polymers from soluble monomers allows the design of novel and rich colloidal features which, in turn, enable many industrial applications. Thus, enzymatic polymerization offers the potential to meet the purity and control offered by synthetic polymeric materials while meeting, by design, the ever more stringent end-of-life requirements.

Natnael Behabtu, PhD



Natnael Behabtu received his PhD in Chemical Engineer at Rice University in 2012, where his work encompassed carbon-based high-performance materials, their complex fluids and nano-scale materials behavior. From 2012 until 2020 Dr. Behabtu worked for DuPont in a diverse set of technology areas, from colloidal science applied in food and cosmetics to textile fibers and biodegradable packaging. When International Flavors and Fragrances, Inc. (IFF) acquired part of DuPont, Dr. Behabtu transitioned to IFF and relocated to their offices in Oegstgeest, Netherlands. He is currently a Global Technology Leader for IFF's Health and Bioscience division, leading new biomaterial development efforts in the enzymatic polymerized polysaccharides space. His present work

focuses on pressing sustainability needs and their societal impact - a generation-defining challenge - with a holistic approach that goes beyond mere technology solutions.