NOBLEAI

USE CASE

Polymer and Formulation Design for Digital Light Processing 3D Printing

Unlock superior mechanical properties and faster print speeds using science-based AI (SBAI)

Target

Estimating the performance of reactive, polymer-based formulations for Digital Light Processing (DLP) 3D printing to enable superior mechanical properties, fast print speed, as well as ideal print quality based on formulation components and print processing conditions.

Relevant polymers: polyurethanes, polyamides, polycarbonates, polyacrylates, polystyrene.

Challenge

Materials have been a limiting factor in 3D printing where the design space has been restricted to only formulation development with time-consuming experimental design techniques. The design space often does not capture the printing process which has significant effects on the material property and the printing efficiency that are important for customers.

Decoupling material development and printing conditions is vital to deliver advanced solutions in the 3D printing industry. Software, hardware, and materials chemistry need to work in concert to deliver superior material properties and ideal print quality for customers.

Solution

Configure NobleAI Reactor to predict the mechanical properties, print speed and print quality (resolution blur, monomer conversion, etc) across a diversity of chemical formulations.

Reactor's science-based ML models can unify kinetic reactivity, transport phenomena, and light attenuation principles of the chemical components with print processing conditions.

The underlying science is embedded into machine learning models to deliver high accuracy predictions of mechanical properties and print quality such as mitigating resolution blur. Additionally, customers can leverage these ML models to scale to industrial production for real-time print optimization.

Reactor's science-based ML models can also accelerate novel polymer and monomer discovery by using inverse design techniques to derive chemical structure insights.