Applicant Name: Arzeda Corp
Control Number: 1916-1701

Summary for Public Release

Methylmethacrylate (MMA) is a large-volume petrochemical monomer with a $6B/y global market. Its homopolymer, polymethacrylic acid (pMMA) is a transparent plastic with applications in surface coatings, automotive and aerospace casts/sheets, and optical devices. Arzeda has identified a new sustainable monomer, Tulipalin A (alpha-methylene butyrolactone, MBL) that as a homo-polymer or co-polymer with MMA yields materials with similar properties as pMMA but significantly higher Tg (105^{o}C for pMMA, 195^{o}C pMBL), improved scratch and mar resistance, weatherability as well improved birefringence in optical applications. Tulipalin A occurs naturally in small amounts in tulips, the metabolic pathway is only partially known, and the molecule is not produced by any microorganism. Chemical routes are too expensive to reach target prices, so today there are no scalable, cost-effective production routes. Using its proprietary computational pathway and enzyme design, Arzeda has designed new enzymes and combined them in novel metabolic pathways in industrial host organisms that can ferment lignocellulosic sugars to Tulipalin A. Here we propose to build upon this successful proof-of-concept and produce polymer-grade Tulipalin A from lignocellulosic feedstock at pilot scale, using our fermentation and downstream processes. These samples will be used to carry out homo- and co-polymer application testing in partnership with PNNL.