

Project Title: Development of Infinitely Recyclable Single-Polymer Chemistry Bio-based Multilayer Films Using Ethylene-Carbon Monoxide Copolymers

Joint Proposal from **Braskem, University of Illinois, Princeton University, and Unilever.**

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Today the majority of plastic littering the environment is packaging material. In this project, we will investigate the possibility to produce infinitely recyclable single-polymer chemistry multilayer films using bio-based ethylene-carbon monoxide (CO) copolymers. We will design these multilayer films to fabricate standup pouches utilized in food packaging application. We will produce the bio-based ethylene-CO copolymers by copolymerizing bio-based CO with bio-based ethylene (sourced from corn and/or lignocellulosic feedstocks) through non-alternating catalytic polymerization under high-pressure conditions. We will examine two different film designs in this project: a) multilayer films made of one specific ethylene-CO copolymer, and b) multilayer films made of ethylene-CO copolymers with different CO content. The main recycling route for both of our proposed single-polymer chemistry multilayer films is mechanical recycling. We will produce at least one prototype of our proposed multilayer films, which compared to conventional multilayer packaging, will display: I) 10% cost reduction, II) comparable performance, III) 60 to 80 wt% recycled carbon utilization in the final design, IV) 60% energy saving during production, and V) photodegradability.

Cost competitiveness, sustainability, and lower amounts of energy required for production will increase the value proposition for recycling multilayer films fabricated from bio-based ethylene-CO copolymer, encourage companies to invest in its recycling by decreasing the cost/benefit ratio, free the landfills and oceans from its presence, and boost the economy by creating jobs in the recycling field.