

Recent Developments in Extrusion of Bio-based Thermoplastic Material

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Adverse effects of petroleum based synthetic polymers on the economy and the environment have led to the growth of renewable bio-based polymer market. The use of starch-, protein- and cellulose-based polymers are increasing due to their biodegradability, sustainability and lesser carbon foot print. Various conventional processing techniques such as extrusion, compression molding, and casting have been modified for the processing of bio-based polymers. This review paper is intended to outline the recent developments in extrusion of bio-based thermoplastic material. Commercially, extrusion is the most widely used method for manufacturing thermoplastics. The extrusion processing conditions have a significant impact on the structure of the polymer, which in turn affect the mechanical and physical properties of the resulting plastics. Extrusion process variables such as screw speed, barrel temperature profile, feed rate, die size and shape, barrel pressure, residence time, and specific mechanical energy (SME) have been studied extensively to process bio-based material. Reactive Extrusion method which involves concurrent reaction and extrusion, is more appropriate for plasticization due to its advantages such as high conversion efficiency and a rapid rate of production. Self-wiping, co rotating twin-screw extruders are more suitable for production of bio-plastics due to more efficient mixing. Bio-based plastics are produced using various polymer blends to overcome the individual drawbacks associated with biopolymers.

Key words: Bio-based polymers, Thermoplastics, Extrusion, Twin-screw Extruder, Process variables