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Rheological behaviour of polymers as the key for developing the extrusion die design

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Today, the World was observing an increased demand in polymers – low-cost and lightweight materials that currently substitute traditional materials such as metals, glass and paper in many applications. The design flexibility that the polymers offer make them extremely valuable for such end industries as construction, packaging, automotive, telecommunication and other related industries.

Polypropylene (PP) is a flexible polymer with diverse applications, including flexible packaging, polymer banknotes, and engineering materials. PP has low density, a higher melting point (about 160ºC) and excellent chemical resistance. This suggests that PP is suitable for injection molding (for heavier-duty applications such as safety helmets, electrical tools, TV casing, etc.), blow molding (for stronger containers such as bottles, tubs, fuel tanks) and extrusion processing techniques (for packaging). Extrusion technique is the most common mashines in polymer processing industry. Extrusion is one of the promising method to prepare different thin films for packaging, which can be defined as the act of a shaping a polymer material by forcing through a die by means of pressure [1].

Rheological data of polymers can be used in determining whether or not a type of polymer can be extruded. It helps in determining the optimal design of extrusion die design, screw geometries of an extrusion technique, various mould cavities for injection moulding.

Viscoplasticity of polymers are characterized by a yield stress, below which the materials will not deform, and above which they will deform and flow according to different constitutive relations. Viscoplastic models include the Bingham plastic, the Herschel Bulkley model, and the Casson model. The Casson model can be used to estimate values of parameters that help characterize the rheological behavior of a polymer materials that exhibit yield stress.

In this work we report about trials to use the Casson model for certain type of polypropylene homo- and copolymers used by local companies. Based on these rheological data, we intent improved designs of the coathanger die for local PP thin film are presented with Casson and power law models. More detailed information of our presented work will be provided on the Poster session.

Biography

K.Korzhynbayeva has completed his PhD at the age of 30 years from Al-Farabi Kazakh National University and postdoc at the Nazarbayev University School of Science and Technology. She has published more than 15 papers in international an kazakhstani journals.

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