

Investigation of Heat Transfer for Extruded Polymers Cooled in Water

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Abstract

The commodity articles from polyethylene (PE) and polypropylene (PP) are widely used in today's world. To reduce the carbon footprint, biopolymers such as polylactic acid (PLA) as commodity plastics are also explored. Often, these polymers have to be extruded before they are fabricated for end users. The work described in this paper has been divided in two parts. In the first part PE, PP and PLA are subjected to extrusion and the extruded polymers are allowed to pass in a water bath having still water. The temperature of still water after 1, 5 and 10 min were determined experimentally using the digital temperature sensor. The temperature gains for the water after the immersion of the extruded polymers were determined at different time intervals. In the second part, the time taken by PE, PP and PLA to lose heat in water was analyzed theoretically with the help of MATLAB software package by taking into account the density, thermal conductivity, heat transfer coefficient and specific heat. The time taken by water (experimentally) to gain heat was then correlated with the time taken (theoretically) by the polymers to lose heat. The influence of Biot numbers for different polymers used in this study is also examined.