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Physicomechanical and thermophysical properties of recycled polypropylene filled with rice husk

Marina V. Bazunova,¹⁺ Elena M. Zakharova,¹ Ainur R. Sadritdinov,¹

Artur A. Psyanchin,¹ Aygiz G. Khusnullin¹ and Vadim P. Zakharov^{2*}

¹Department of Macromolecular Compounds and General Chemical Technology. Chemical Faculty. Bashkir State University. Zaki Validi St., 32. Ufa, 450076. Republic of Bashkortostan. Russia. Phone: +7 (347) 229-97-24. E-mail: mbazunova@mail.ru

²Scientific Institution of the Ufa Federal Research Center of the Russian Academy of Sciences. Oktyabrya Ave., 71. Ufa, 450054. Republic of Bashkortostan. Russia.

Phone: +7 (347) 235-60-22. E-mail: zaharovvp@mail.ru

*Supervising author; +Corresponding author

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Abstract

An urgent problem in the field of processing thermoplastic polymers is the development of polymer composites based on secondary polymer raw materials filled with components of plant origin. This makes it possible to involve plastic waste in recycling, as well as to reduce the share of a hardly degradable synthetic polymer in a plastic product by replacing a part of the polymer matrix with a biodegradable plant component. The aim of this work was to study the deformation-strength and thermophysical properties of a polymer composite based on recycled polypropylene filled with rice husk. It is shown that with an increase in the degree of filling of secondary polypropylene with rice husk up to 30 weight parts. the modulus of elasticity at break increases from 1510 to 2066 MPa, and in bending – from 1023 to 1244 MPa, while the tensile strength decreases from 23.0 to 20.9 MPa. Impact strength according to Charpy and Izod decreases with an increase in the degree of filling the polymer composite with rice husk, and the most significant changes are observed for the Charpy index. The increase in impact toughness occurs only when tested according to Izod (without notching) with a rice husk content in the range of 2-5 weight parts. Filling recycled polypropylene with rice hulls increases the heat resistance of polymer composites, thereby increasing the bending temperature under load from 57.4 to 64.9 °C and Vicat softening temperature from 137.2 to 146.8 °C (at a load of 10 N). For composites containing 2-15 weight parts. In rice hulls, a decrease in the degree of crystallinity of the polymer phase is noted from 72.9% for individual secondary polypropylene to 68.9-69.3% for a composite.

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