

**DESIGN AND RESEARCH OF ECO-FRIENDLY COFFEE GROUNDS
FILLED POLYMER COMPOSITES**

Vladimir Lebedev¹, PhD, Associate Professor
Tetiana Tykhomyrova¹, PhD, Associate Professor
Lozovytskyi Arsenii¹, student
Grigorova Tetiana², Research
Ievgeniia Litvinenko¹, PhD, Associate Professor
Svitlana Avina¹, PhD, Associate Professor
Zhaniya Saimbetova³

¹*National Technical University «Kharkiv Polytechnic Institute», Kharkiv, Ukraine*

²*The National Science Center Kharkiv Institute of Physics and Technology, Kharkiv, Ukraine*

³*Bayer KAZ LLP, Kazakhstan*

The aim of the research was to develop and study biodegradable polymer composite materials based on PLA and coffee grounds waste. The ways of using coffee grounds as fillers for biodegradable polymer material and dishes from it is shown. Research of chemical, physical, mechanical and operational properties of new high-filler composite based on polylactide are carried out. It is also noticed, that using coffee grounds as fillers for polymer materials can decrease the total volume of it at landfills faster than any other method of coffee ground reuse [1-2]. It is shown a 2,5 times increase in the impact strength for coffee-filled composite for the sample with a content of 40%, which is predictable, since the filled polymeric materials always have a higher impact strength than homopolymers. Comparing the dependence of the high-fill PLA impact strength on the coffee grounds, there is a tendency to increase the value of impact strength with increasing filler content [3]. The increase of breaking stress during bending (table 1) also indicates the manufacturability of the new polymer composite material. Thus, it becomes evident that the coffee grounds are evenly distributed in the PLA matrix [3]. In addition, it even slightly "softens" the original rather rigid PLA polymer. All this together with the impact strength suggests that the possibility of forming various products of composite material, with particular attention is deserved composition with a content of coffee grounds 40 mass%. The increase in the physical and mechanical properties of PLA when making coffee grounds is connected with a decrease in the specific surface area from 5.3 m²/g to 3 m²/g, which indicates that the introduction of coffee grounds increases the uniformity of the polymer material. The possibility of processing new polymeric biodegradable material with organic fillers like dry coffee grounds is demonstrated. Researching of chemical and thermal properties of new material are carried out. Looking for infrared spectroscopy it is noticed, that any destruction of PLA without and with fillers like coffee grounds, as well as chemical transformations do not occur in it. Complex of physical and mechanical properties for composition based on PLA with 40 mass % of fillers like coffee grounds is several times better than one for

pure PLA. It is proved, that new composition is also biodegradable after 60 using cycles.

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