

## TECHNOLOGY FOR SYNTHESIS OF TEREPHTHALAMIDE FROM PLASTIC WASTE

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### Abstract

In this study, a technology was developed to obtain a valuable product - terephthalamide - by recycling plastic waste, which causes great harm to the environment. The developed technology consists of two main stages: in the first, terephthalic acid was isolated from plastic waste by hydrolysis, and in the second, terephthalamide was synthesized by reacting this acid with urea. This method is environmentally friendly, relatively inexpensive and highly efficient, and ensures the recycling of waste.

**Keywords:** plastic waste, terephthalic acid, terephthalamide, hydrolysis, neutralization, autoclave.

### Introduction

Plastic waste is one of the global environmental problems today. Their decomposition time is very long, which leads to pollution of soil and water bodies. Therefore, obtaining secondary, useful products through their processing is one of the important scientific and practical directions. Waste based on polyethylene terephthalate (PET) is very suitable for chemical processing. The polymer chains in them can be hydrolyzed to extract useful substances. In this work, a technology was developed to hydrolyze plastic waste and obtain terephthalic acid and then terephthalamide from it.

### Experimental part

In the experimental work, initially sorted plastic waste was crushed and hydrolyzed with NaOH solution.

- Reaction conditions: Plastic and NaOH (together with water) were mixed in a ratio of 1:2.

- Temperature: 180 °C- Time: 3 hours- The solute was dissolved in warm water and then filtered.

- The resulting solution was neutralized with HCl acid and again from the filter was held.

The product separated from water was dried at 45–50 °C .

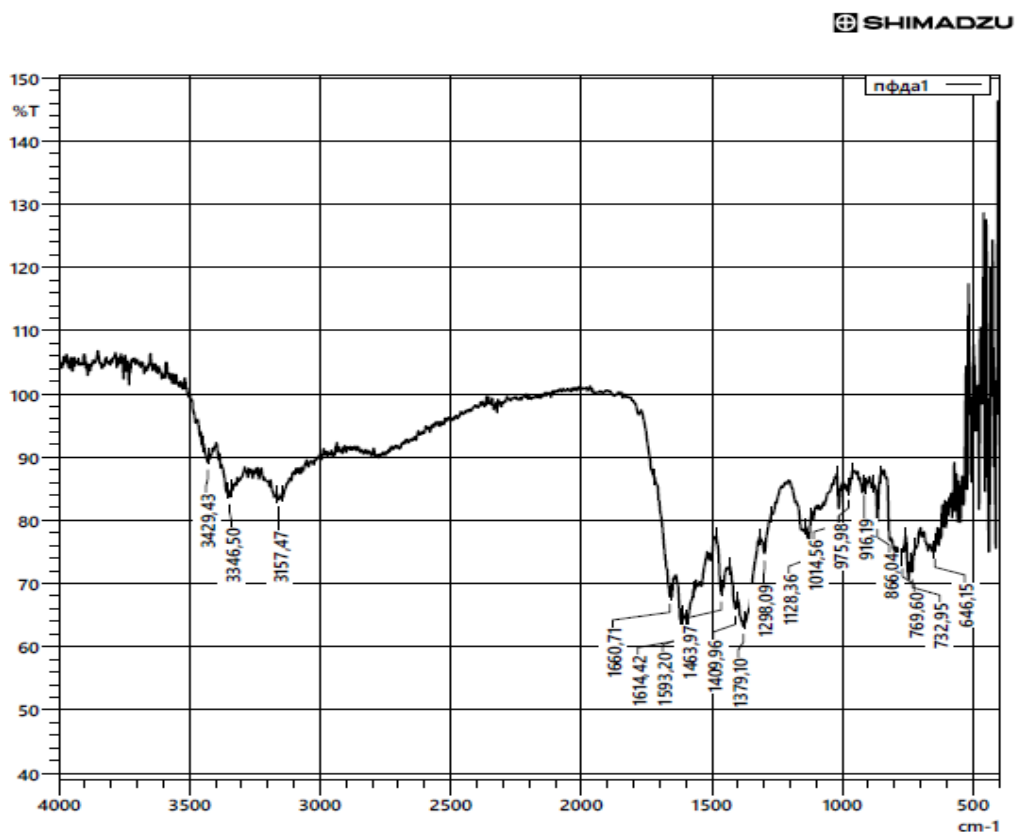
At this stage, terephthalic acid was obtained with a yield of 55–60%. In the next step, the obtained acid was reacted with urea :

- Ratio: 1:2 (terephthalic acid: urea) - Apparatus: Autoclave - Conditions : 185 °C, 3–5 atm pressure

- Time : 3 hours

Reaction as a result terephthalamide was formed. The synthesized product was then characterized by spectroscopic and physicochemical methods. with analysis was done .IR- spectroscopic analysis result

The structure of the substance obtained as a result of this reaction was studied and analyzed using the IR spectrum (Fig.1).



**Figure 1. IR spectrum of terephthalamide**

## Results and discussion

Experiments have shown that terephthalic acid can be efficiently obtained by hydrolyzing plastic waste. The neutralization and drying stages affect the quality of the product. High-quality terephthalamide was obtained from terephthalic acid reacted

with urea. This compound can be used as an important raw material in the synthesis of polymeric materials or monomers in subsequent stages. The proposed technology is relatively simple, economically viable and environmentally friendly, and can be an alternative solution for waste recycling.

### Conclusion

The synthesis of terephthalic acid, a useful substance, and terephthalamide from it through the hydrolysis of plastic waste has been successfully carried out. This process allows for environmental protection, waste reduction, and the production of products with high added value. In the next stages, the prospects for the use of synthesized products in polymer materials will be studied.

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