Mass Dyeing of Synthetic Fiber

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Annotation: *The process of mass dyeing of polyethylene terephthalate fiber with a dispersed dye was studied. Elementary fiber obtained from secondary PET granules is characterized by high color intensity and fastness to soapy water.*

Keywords: *polyethylene terephthalate, fiber, secondary PET, polycondensation, Primary PET.*

Chemical yarn and fibers are the main raw materials of the textile industry. The large production of such products makes it possible to increase the assortment of a wide range of consumer goods - gauze, knitted, non-woven gauze materials. When polyesters are heated, they turn into a flowing liquid state without breaking down, which makes it possible to use the "method of fiber extraction from dilution" in the formation of fibers from them. The molecular mass of the polymer is of great importance in obtaining fibers, and polymers with a regular structure that are not too large are well leached. Also, the temperature is the main factor when transferring fiber-forming polymer to liquid and extracting fiber from it, including polyethylene terephthalate (PET) liquefaction temperature is 240°C, due to its high viscosity, its processing is carried out at a temperature of 290-295°C, but under such conditions, decomposition in the polymer the beginning of the process should not be ignored [1-3].

The dyeing process can be done in mass and dry method. It is known that, depending on the molecular weight of the obtained PET fiber, the diglycol ether of terephthalic acid is polycondensed in two or three devices. 2 polycondensation devices are used since the molecular mass of PET intended for obtaining fiber is 22000-25000. To obtain dyed polymer, dye, titanium oxide and other additives are added to the finished polymer mass obtained in the second polycondensation apparatus before it is sent to the fiber extraction machine.

In the researches, PET granule was added to the diluted porcelain container in the form of powder, dispersed with surfactant, and mixed with paraffin, and with constant stirring, an attempt was made to evenly distribute the dye in the polymer liquid. However, keeping PET at a high temperature for a long time leads to destruction (decrease in molecular weight) and due to the complexity of achieving uniform distribution of the dye in the dilution in a laboratory device, it was observed that low intensity colors are formed in the fiber samples formed (Fig. 1).

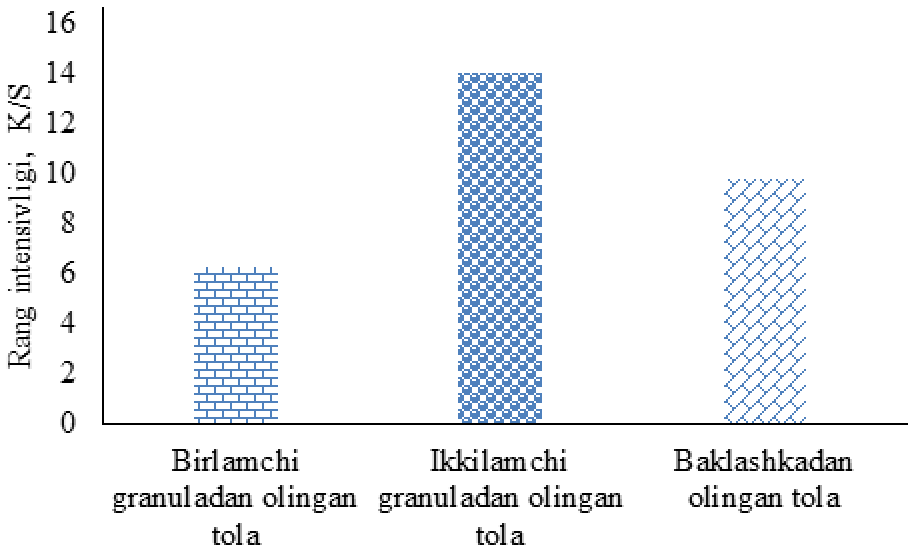

Figure 1. PET fiber color intensity index

The highest color intensity of the investigated fibers formed from polyethylene terephthalate granules was (K/S)=14 in the secondary fiber and (K/S)=9.7 in the fiber obtained from the legume.

The higher color intensity in the secondary PET granule and secondary PET container samples may be related to the change in the supramolecular structure due to the disordered arrangement of macromolecules as a result of processing. Fiber samples were checked for color fastness (Table 1).

Table 1. Color intensity of mass-dyed PET fiber

Types of granules	Indicators	
	Before washing	After washing
Primary PET	6	6
Secondary PET	14	14
PET from bottles	9,7	9,7

The fact that the color intensity of dyed fibers in the dyed state did not change after boiling in a 2 g/l solution of CAM for 30 minutes confirmed that the mass dyeing method produced stable colors for aqueous treatments.

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