STUDYING THE FEASIBILITY OF DYEING COMPOSITE PET FIBERS WITH WATER-SOLUBLE DYES

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Abstract. *The dyeing process of composite fibers based on recycled polyethylene terephthalate using a water-soluble dye has been investigated. It was possible to achieve a consistent color when dyeing composite fibers with varying composition ratios at a temperature of 95°C.*

Keywords: *polyethylene terephthalate, composite fiber, reactive dye, dyeing, color intensity*

ИЗУЧЕНИЕ ВОМОЖНОСТИ КРАШЕНИЯ КОМПОЗИЦИОННЫХ ПЭТ ВОЛОКОН ВОДОРАСТВОРИМЫМИ КРАСИТЕЛЯМИ

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Аннотация. *Изучен процесс крашения композиционных волокон на основе переработанного полиэтилентерефталата водорастворимым красителем. Достигнуто получения аналогичного цвета при окрашивании композиционных волокон с различными соотношениями при температуре 95°C.*

Ключевые слова: *полиэтилентерефталат,композиционное волокно, активный краситель, крашение, интенсивность цвета.*

КОМПОЗИЦИОН ПЭТ ТОЛАЛАРНИ СУВДА ЭРУВЧАН БЎЁВЧИ МОДДАЛАР БИЛАН БЎЯШ ИМКОНИЯТЛАРИНИ ЎРГАНИШ

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Аннотация. *Қайта ишланган полиэтилентерефталат асосида олинган композицион толаларни сувда эрувчан бўёвчи модда билан бўяш*

жараёни ўрганилди. Турли нисбатли композицион толаларни 95^{0}C ҳароратда бўялганда бир хил ранг олишга эришилди.

***Калит сўзлар**: полиэтилентерефталат, композицион тола, фаол бўёвчи модда, бўяш, ранг интенсивлиги.*

The modern market principle for the development of new textile and technical products is based on the following demand chain: a product with a specified functional purpose → textile material → fiber. While modern chemical fibers and yarns are becoming increasingly comparable to natural fibers in terms of hygienic properties and comfort, the approach to imparting qualitatively new properties that determine their potential applications has remained unchanged.

The dense structure of synthetic fibers limits their dyeability with water-soluble dyes. However, by modifying polyester fibers, it is possible to control their hydrophilicity, dyeability, and other properties.

This research focuses on investigating the dyeing process of recycled PET-based composite fibers using reactive dyes. Since the investigated fibers underwent partial drawing during the fiber formation process, the dyeing procedure was carried out using a method recommended for regenerated cellulose fibers. Under laboratory conditions, porous-structured composite fibers produced from primary and secondary PET granules were dyed using a batch dyeing method. The dye bath contained a reactive dye, an electrolyte, and soda ash (sodium carbonate). Initially, the effect of dye concentration (1–3%) in the dye bath on the color intensity achieved in the fibers was investigated.

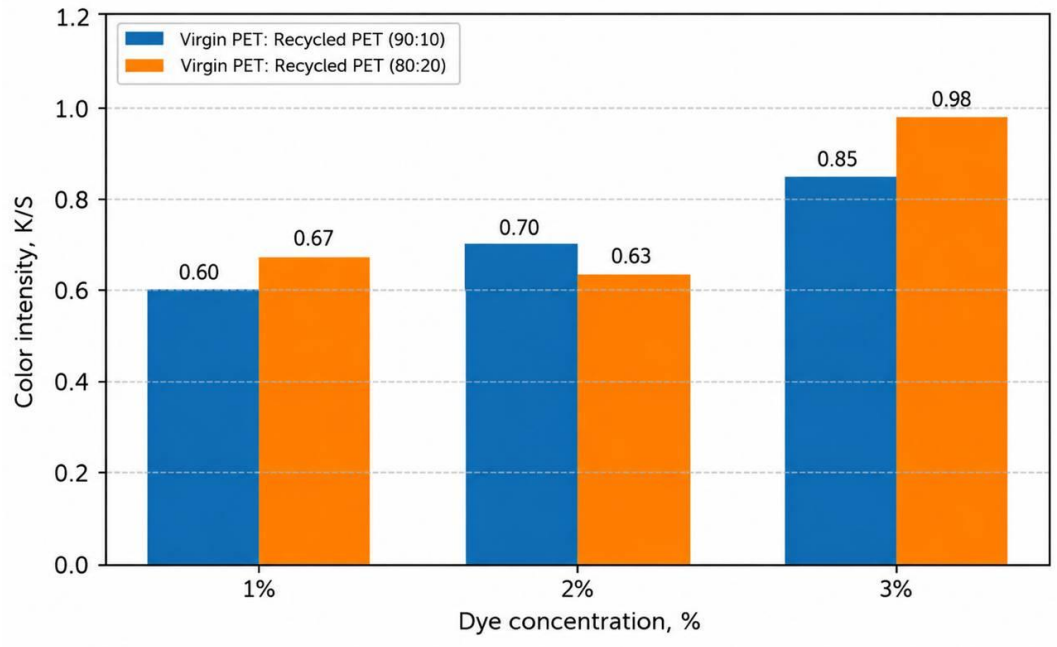


Figure 1. Dependence of the color intensity of dyed fibers on dye concentration

As shown in Figure 1 above, increasing the dye concentration leads to a linear increase in color intensity in the composite fiber with a 90:10 ratio. In contrast, for the fiber with an 80:20 ratio, the color intensity decreases when the dye concentration in the solution is 2%, whereas an increase in color intensity is observed at a concentration of 3%.

One of the factors affecting the color characteristics of PET fibers is the dyeing temperature. Therefore, the effect of dyeing temperatures (30, 45, 60, 85, and 95 °C) on the color characteristics of the dyed fibers was investigated.

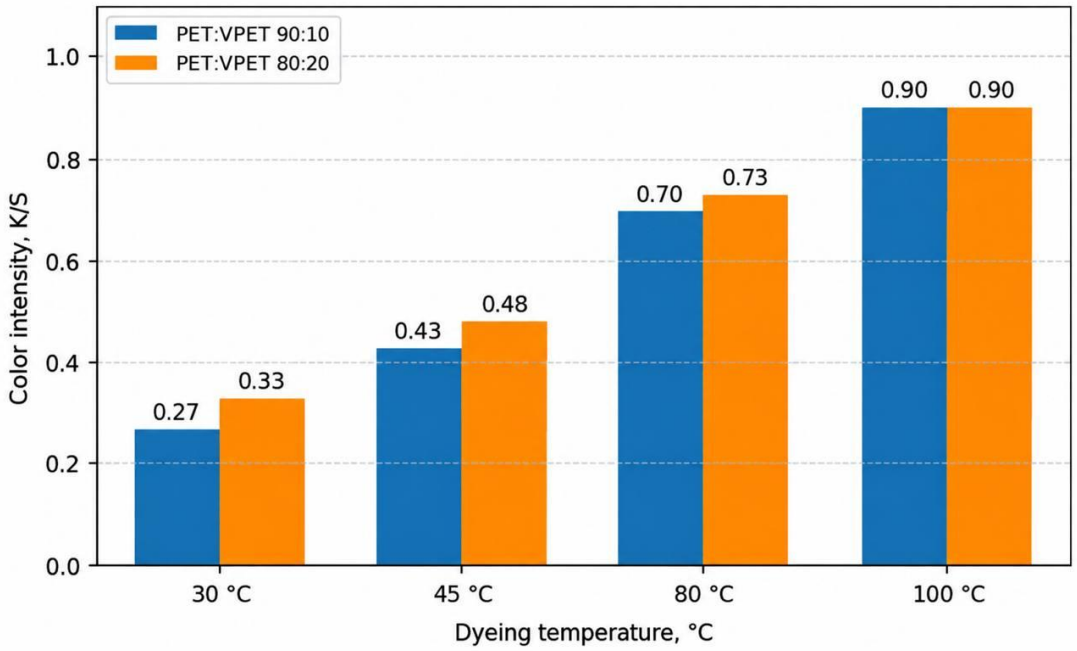


Figure 2. Dependence of the color intensity of dyed fibers on dyeing temperature

As shown in Figure 2, increasing the dyeing temperature to 95 °C resulted in an increase in the color intensity of PET fibers. In particular, the fiber with an 80:20 ratio exhibited higher color intensity than the fiber with a 90:10 ratio. The observation of the same color shade in both fibers at 95 °C can be attributed to the similar diffusion of dye molecules into the free volume of substrates with relatively similar supramolecular structures.

The conducted studies demonstrated that the composite fiber with an 80:20 ratio has a higher sorption capacity than the fiber with a 90:10 ratio, allowing a greater number of dye molecules to diffuse into its amorphous regions.

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