GREEN ALTERNATIVE FOR WOOLEN KNITWEAR DYEING WITH WALNUT HULLS USING DEEP EUTECTIC SOLVENT

Milena Nikodijević[1*], Slađana Kapuši[1], Dragan Troter[1], Sandra Konstantinović[1]

[1]*University of Niš, Faculty of Technology, Bulevar oslobođenja 124, Leskovac, Serbia, nikmilena94@gmail.com**

Abstract

About 20% of the world's clean water pollution is considered to be caused by the textile industry's dyeing and finishing processes. Therefore, it is necessary to develop an environmentally acceptable but also economically profitable dyeing process. Wool is a natural fiber with a high content of keratin (about 80%) and sulfur and has specific properties such as fire resistance, elasticity, hygroscopicity, low thermal conductivity, and antistatic. Because of these characteristics, wool is often used in the production of high-quality textile products. Although wool is dyed with acid, metal complex, and sulfur dyes, in recent years there has been a growing interest in the use of natural dyes, which offer a more environmentally sustainable alternative to synthetic dyes. In this paper, 100% woolen knitwear made of extra fine merino wool was used, with a mass per unit area of 434 g/m² and fineness of 48×2 tex. The dyeing process was carried out in a deep eutectic solvent consisting of urea, betaine hydrochloride, and glycerol (molar ratio 1:1:1) with walnut hulls powder. The procedure was performed at 80 °C for 60 minutes with a bath ratio of 1:50 at different dye concentrations (10–50%) and pH 4. Dyeing efficiency was analyzed using K/S and CIELab parameters. The results of the CIELab parameters showed that the woolen knitwear was successfully dyed in the deep eutectic solvent using the natural walnut hulls. The highest differences of CIELab parameters between the raw and dyed samples were observed at 50% dye concentration (ΔL -23.18, Δa*=5.76, Δb*=2.69, ΔC*=3.55, ΔE*=24.04). Obtained results for CIELab were confirmed by K/S values obtained for all dyed samples. The CIELab and K/S values showed that the dyeing of woolen knitwear in the deep eutectic solvent with natural walnut hulls can be a good alternative to the standard dyeing process, considering environmental and techno-economic aspects.*

Keywords: *wool, knitwear, dyeing, natural dye, deep eutectic solvent.*