DEVELOPING OF SUSTAINABLE SOLUTION FOR REDUCTIVE WASHING OF DISPERS DYED POLYESTER

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Abstract: In the study, the novel hybrid material was tried to be developed for disperse dyed polyester (PES) fibre instead of reductive washing. PES fiber ranks first in the world with a consumption of 60 million tons/year. In general, polyester is dyed with disperse dyestuff. After dyeing, the washing of textile materials from polyester fibers is made by reducing agents to clear the surface and increase the color fastness performance [1]. Currently, environmentally unfriendly agents are preferred for this process because they are cheap. It is necessary to develop alternative chemicals and processes which are also suitable with the European Greendale and other regulations. For this process, different reductive agents can be preferred for reductive washing at alkaline/acidic conditions and at high temperature [2]. Although different reducing agents with chemically lower free sulfur content have been introduced in recent years, their environmental impact is still debated. It reacts immediately with free oxygen to form sulfur dioxide gas. The classified as a pollutant by the Environmental Protection Agency, SO_2 is defined as a toxic gas that poses a threat to both the environment and human health. Therefore, the fact that they are both not environmentally friendly and imported has made it necessary to develop alternatives to these substances. When the publications in the literature in this field were examined, it was determined that hydrosulfite, thiouredioxide, boron-based reducing products were used. Polyoxometalate compounds have extraordinary properties and are frequently studied in materials science [3]. Their compounds have very strong electron-giving and electron-receiving properties. They interact with organic molecules to form covalently bonded hybrid materials. POM-based covalently bonded organic-inorganic hybrid materials have an important place in the fields of chemistry and materials. Due to their applications in catalysis, molecular organization, electronics and photochemistry, the design and synthesis of covalently bonded organic-inorganic hybrid compounds has become extremely important [4]. In this study, unlike the existing synthesized hybrids found in the literatures, the donor oxygen atoms of metallocene-based ligands were synthesized coordinated to POM ions and their characterizations were made (Figure 1). In this way, the electron density on POM was increased. The increasing the electron density in the hybrid material increased the activity of hybrids and metal complexes. The small polar molecules containing anthraquinone or azo groups in the structure of disperse dyes, which generally do not have charged cationic or anionic groups in the structure, bond with the hybrid material and remove them from the environment. The novel reductive washing process was tried to be developed with this alternative agent synthesized in the study. We used to disperse dyestuff having big molecule and 100% polyester knitted fabric. After application of hybrid material and conventional reductive washing agents to the dyed polyester, the color fastness to washing, alkaline and acidic perspiration, rubbing and washing applied to the samples. The CIELab values was also measured by spectrophotometer and calculated the color differences between samples. Thus, the performance of the new hybrid material developed could be determined and the possibility of using it for disperse dyed polyester was determined.

Keywords: Hybrid material, disperse dyes, color fastness, polyester, CIELab, reductive washing

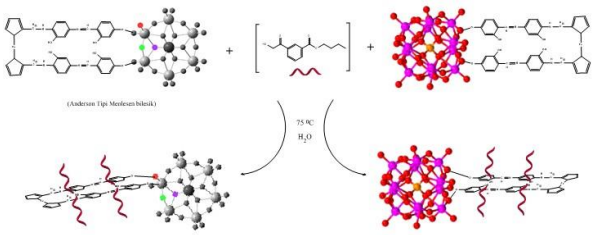

Figure 1 Hybrid compound-assisted backwash process

REFERENCES

[1]. Kumar K, Pradines B, Madamet M, Amalvict R, Benoit N, Kumar V, (2014). [1]H-1,2,3-triazole tethered isatin-ferrocene conjugates: Synthesis and in vitro antimalarial evaluation. *Eur J Med Chem*; 87:801

[2]. Uahengo, V.; Xiong, B.; Zhao, P.; Zhang, Y.; Cai, P.; Hu, K.; Cheng, G, (2014 Sep). Three channel Ferrocene-Based Chemosensory for Cu (II) And Hg (II) In Aqueous Environment's Sens. *Actuators B*; 190:937– 945.

[3]. Liu, K. G., Rouhani, F., Shan, Q. D., Wang, R., Li, J., Hu, M. L., & Morsali, A. (2019). Ultrasonic-assisted fabrication of thin-film electrochemical detector of H_2O_2 based on ferrocene-functionalized silver cluster. Ultrasonic Sonochemistry, 56, 305-312.

[4]. Pfaff, U., Hildebrandt, A., Korb, M., & Lang, H. (2015). The influence of an ethynyl spacer on the electronic propertiesin2,5–ferrocenyl–substituted heterocycles. Polyhedron, 86, 2-9.