3 in 1: A Novel Method for Microplastic, Industrial Dye and Biological Pollutant Removal From Wastewater

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Chemical dyes, biological pollutants and microplastics are some of the most harmful pollutants that hinder the usability of water. Since it is very difficult and expensive to treat these pollutants with current techniques, traditional methods are not preferred and new systems are needed. In this study, PAMAM dendrimer was used for the first time for microplastic treatment. The dendrimer was obtained by divergent synthesis method. Moreover, the column filling material has been developed by using low-cost and sustainable resources which aims to treat chemical dyes and biological pollutants. The material is produced by zeolite with increased adsorption capacity (surface modification with (3-Aminopropyl)triethoxysilane) and Lawsone extracted from the leaves of the Lawsonia inermis plant. The obtained FTIR, SEM, AFM results show that the PAMAM Dendrimer significantly treats microplastics. In addition, the obtained FTIR, DTA, TGA results show that the surface of the zeolite is successfully modified and that the surface modified zeolite binds successfully with Lawsone and the UV-Visible Spectroscopy results show that column filling material produced successfully treats chemical dyes. The obtained results show that the column filling material presents antibacterial activity. Developed materials (PAMAM Dendrimer and antibacterial column filling material) were combined and turned into two different products. First, it has been integrated into a 100% autonomous boat, which will provide mobile treatment in areas such as the sea, lake, and pool. Secondly, this system was integrated into the washing machines, preventing the release of textile dyes and microplastics from the washing machines into nature.

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