PROGRESS IN GREEN TEXTILE DYEING TECHNOLOGY: PRESENT AND FUTURE

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The textile industry is believed to be one the largest consumer of water. Conventional textile dyeing processing uses a significant amount of water in many pretreatment and finishing processes, such as washing, scouring, bleaching, dyeing and finishing. Then, water is discharged as waste water which contains dyestuff chemicals, additives and dispersing agents (billions of gallons of contaminated water). Therefore, the textile industry has accelerated efforts to reduce or eliminate water consumption in all areas of the textile processes. Green (carbon dioxide as a fluid medium) textile dyeing technology has the potential to be scale-up of processes from a semi-production to commercial facilities in many textile applications in many countries, both at present and in the future around the world. Positive environmental effects range from drastically reduced water consumption to eliminating hazardous industrial effluent. Consequently, economic benefits increased productivity, air emissions and significant energy savings. As a final impact, supercritical carbon dioxide (CO_2) textile processing will be faster dyeing time, more economical and more environmental friendly (green technology).

The ultimate goal of this project will be the commercialization of the supercritical fluid CO_2 processing in many textile applications This process will improve the economics of dyeing and other textile chemical processes by eliminating water usage and wastewater disposals and increasing productivity by reducing processing times as well as required chemicals and other auxiliaries and finally reducing energy consumption and air emissions. Therefore, supercritical CO_2 is of the most environmentally fluid solvent (inexpensive, nontoxic, nonflammable, etc.) in use today, and textile processes using it have many advantages when compared to conventional water processes around the world.

At the present, the research performed represents a significant advance in obtaining the knowledge required to commercialize a green process to dye different materials (polyester, cotton, blends, etc.) in supercritical CO_2. This process involves the use of less energy (heat) than conventional water processes, resulting in a significant of up to ~40% lower operating costs (chemicals, water, electricity, fuel, etc.). However, there remains potential work to be planned and conducted in this area by using supercritical fluids as a green textile technology.

This green novel technology will open new opportunities for the supercritical fluid processing of textiles that may prove to be highly beneficial path progress for the textile industry in this textile dyeing and others applications at present and in the future around the world. As a conclusion, the use of supercritical CO_2 is projected to make textile processing more economical and environmentally friendly.

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