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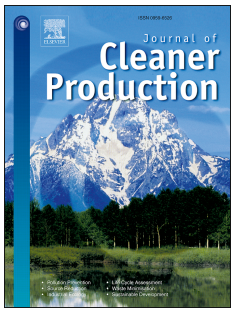

Environmental sustainability evaluation of innovative self-cleaning textiles

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Abstract

Nanotechnology has high technological potential for textile industry. An important application of this technology in this sector is a novel concept of textile, called “self-cleaning textiles”, that can be easily washed and maintained, capable to improve the process performances in terms of energy and resources consumption. The new textile is realized by depositing on the surface a nanocrystalline TiO2 photo-catalytic layer, which is able to destroy organic material by solar irradiation. This finishing process, is able to reduce the maintenance costs of textile products, including a reduction in the consumption of water and chemicals/detergents, and to significantly reduce the temperature required for the removal of persistent stains.

In this study, Life Cycle Assessment (LCA) was applied to a self-cleaning textile in order to quantify its environmental advantages. The calculations were performed with the SimaPro software version 7.3.3 and the main database used for this study is Ecoinvent version 2.2.

In particular the ecological earnings were evaluated by comparison of the production and the use phases of the innovative and conventional materials in a variety of application scenarios. The results show that the innovative system has lower impact with all the chosen LCIA methods (CED, GWP100, ReCiPe) and reduced tap water consumption.