EuroSciCon

EuroSciCon Conference on

Nanotech & Nanobiotechnology

July 12-13, 2018
Paris, France

Nano Res Appl 2018, Volume 4
DOI: 10.21767/2471-9838-C2-012

COATINGS BASED ON TIO_2 NANOPARTICLES AND BIOMACROMOLECULES AS A NEW FLAME-RETARDANT APPROACH FOR COTTON FABRICS

S Ortelli[1], G Malucelli[2] and A L Costa

[1]ISTEC-CNR, Italy
[2]Politecnico di Torino, Italy

A novel durable intumescent flame-retardant coating, based on metal oxide nanoparticles (NPs) and biomacromolecules, was designed and applied on cotton fabrics. This way, it was possible to combine the thermal insulating effect of the inorganic coating with the intumescent properties of the selected biomacromolecules, able to absorb the heat and oxygen from the atmosphere and blocking their transfer to the surrounding textile. Two peculiarities were exploited, namely: i) the ability of proteins and aminoacids to irreversibly cover NPs, according to protein corona theory and ii) the affinity of metal oxide NPs towards the natural hydrophilic fibers, for improving the washing fastness of the fire-resistant finishing. To this aim, different TiO_2 NPs/biomacromolecules systems were deposited by dip-pad-dry-cure process and the morphology of the resulting coating assessed by SEM analysis. The enhancement of the durability (i.e. the resistance to washing treatments) was verified by release tests carried out in static and dynamic conditions. Flammability and cone calorimetry tests were performed for evaluating the fire behaviour of the treated fabrics. More specifically, in horizontal flame spread tests, the different nanoparticles/biomolecules-based coatings provided an increase of the total burning time and the decrease of the burning rate. Furthermore, the residues at the end of the test were significantly higher with respect to untreated cotton fabric. Therefore, thanks to their high char-forming character, the combination of TiO_2 nanoparticles and biomacromolecules within coating may represent a valid durable fire-resistant finishing alternative to standard flame-retardant treatments for cotton.

simona.ortelli@istec.cnr.it