

Accepted Manuscript

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PII: S0141-8130(18)30463-X
DOI: [doi:10.1016/j.ijbiomac.2018.03.109](https://doi.org/10.1016/j.ijbiomac.2018.03.109)
Reference: BIOMAC 9331

To appear in:

Received date: 27 January 2018
Revised date: 10 March 2018
Accepted date: 19 March 2018

Please cite this article as: Santanu Basak, S. Wazed Ali , Fire resistant behaviour of cellulosic textile functionalized with wastage plant bio-molecules: A comparative scientific report. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Biomac(2017), doi:[10.1016/j.ijbiomac.2018.03.109](https://doi.org/10.1016/j.ijbiomac.2018.03.109)

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Fire resistant behaviour of cellulosic textile functionalized with wastage plant bio-molecules: a comparative scientific report

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Abstract

Three different wastage plant based bio-molecules named banana peel powder (*Musa acuminata*) (BPP), coconut shell (*Cocos nucifera*) extract (CSE) and pomegranate rind (*Punica granatum*) extract (PRE) have been explored as fire resistant material on the cellulosic polymer (cotton fabric). To this end, extracts have been applied to the cotton fabric in different concentration at elevated temperature for specific time period. Treated cotton fabric showed 6 (BPP), 8.5 (CSE) and 12 (PRE) times lower vertical burning rate compared to the control cotton fabric. Thermo-gravimetry (TG) curves and the limiting oxygen index (LOI) value revealed that the PRE extract (LOI: 32) treated fabric encompassed more thermal stability compared to the BPP (LOI:26) and the CSE (LOI: 27) treated fabric as it showed higher oxygen index and more weight retention (40%) at higher temperature 450°C. Moreover, the carbonaceous samples remained after the burning of the extracts and the treated fabrics showed structural integration and more carbon content [65.6 (PRE extract) and 76.3% (PRE treated cotton)] compared to the fragile, net like char of the control cotton fabric, having less carbon content (49.8%). Gas Chromatography Mass spectroscopy (GC-MS) of the different extracts (CSE, PRE, BPP) used for the study showed the presence of high molecular weight aromatic phenolic compounds, tannin based compound and the

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