

A Chemical-Free Colouration Technique for Regenerated Fibres Using Waste Alpaca Fibres

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Abstract : Generally, the colouration of textile fibres is performed by using synthetic colourants in dope dyeing or conventional dyeing methods. However, the toxic effect of some synthetic colorants due to long-term exposure can cause several health threats including cancer, asthma and skin diseases. Moreover, in colouration process, these colourants not only consume a massive amount of water but also generates huge proportion of wastewater to the environment. Despite having the environmentally friendly characteristics, current natural colourants have downsides in their yield and need chemical extraction processes which are water consuming as well. In view of this, the present work focuses to develop a chemical-free biocompatible and natural pigment based colouration technique to colour regenerated fibres. Waste alpaca fibre was used as a colourant and the colour properties, as well as the mechanical properties, of the regenerated fibres were investigated. The colourant from waste alpaca was fabricated through mechanical milling process and it was directly applied to the polyacrylonitrile (PAN) dope solution in different ratios of alpaca: PAN (10:90, 20:80, 30:70). The results obtained from the chemical structure characterization suggested that all the coloured regenerated fibres exhibited chemical functional groups of both PAN and alpaca. Furthermore, the color strength was increased gradually with the increment of alpaca content and showed excellent washing fastness properties. These results reveal a potential new pathway for chemical-free dyeing technique for fibres with improved properties.

Keywords : alpaca, chemical-free coloration, natural colorant, polyacrylonitrile, water consumption, wet spinning

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