ABSTRACT SUBMISSION

-For invited speaker only

The In-situ Coloration of Silk through Coupling Reaction with Primary Aromatic Amine Dyes

Jin-Fang Cai[1], Wei-Guo Chen[1,2*] , Zhi-Hua Cui[1,2], Hua Jiang[2]

[1] *Key Laboratory of Advanced Textile Materials and Manufacturing Technology, Ministry of Education of China, Zhejiang Sci-Tech University, No.2 Street of Xiasha, Hangzhou, Zhejiang, 310018, China*
[2] *Engineering Research Center for Eco-Dyeing & Finishing of Textiles, Ministry of Education of China, Zhejiang Sci-Tech University, No.2 Street of Xiasha, Hangzhou, Zhejiang, 310018, China*

[*]Presenter's email: wgchen_62@126.com

ABSTRACT (NO MORE THAN 500 WORDS:)

Silk with the properties of soft handle, elegant style and comfortable wearing is regarded as a luxurious clothing and decoration materials. Nowadays, acid dyes and reactive dyes have been considered as the mainly suitable synthetic dyes for silk in spite of some problems still existing. Reactive dyes are considered to be comparatively ideal dyes for silk due to the formation of covalent bond between dyes and silk macromolecules, which offers the dyed silk relatively better wet fastness than acid dyes. However, the covalent bond formed between dyes and silk could be readily hydrolyzed in acidic or alkaline solution. Additionally, the hydrolysis of the reactive groups during dyeing processes results in a part of dyes unfixed on the fibres and leading to the effluent more polluted.

There is a relatively high tyrosine residue content in silk fibroin (~6 mol%), and these residues might be potential reactive sites for dyeing. In particular, the p-methylenephenol side group of the tyrosine residue could undergo coupling reactions with diazo compounds to form azo chromophores linked to the protein by C-C covalent bond, which is very stable under acidic or basic solution. This type of reaction is quite similar to the commercial process for ice azoic dyeing of cotton. The novel coloration method provides excellent wet fastness and solvent-resistance due to fixed C-C linkage between azo chromophore and macrochain of silk protein.

In our work, the dyestuffs with varying chromophores containing primary aromatic amino groups were synthesized and applied as dyeing agents for the coloration of silk. The dyeing process was optimized to adapt the structure of dyestuffs. With the increase of π-conjugation, a structure-based bathochromic effect was observed from the colour spectrum of the coloured silk fabric compared with that of dyestuff itself. The azo bond between fibroin and the dyestuff containing primary aromatic amino groups promoted the wet colour fastness. This novel dyeing method will have great potential of application.