Based on the optimal mordanting condition, the falling rate of fibre strength is relatively big, but fibre fineness and fibre crimp properties were apparently not damaged after bleaching. Meanwhile, due to the damage effect on the fibre internal structure, frictional properties of the fibres were also influenced.

During the spinning process, based on the damage degree of bleached yak fibres, the levels of wool lubricating oil, yarn twist, spinning gauges, and machine speeds were adjusted. The results show that the differences between these two yarns' evenness and hairiness are small. Furthermore the falling rate of strength, elongation and tenacity are 8.23%, 8.90% and 8.35%, which can all be acceptable for industrial production.

Acknowledgements

This work was supported by the National Engineering Laboratory for Advanced Textile Processing and Clean Production, State Key Laboratory for Hubei (GCSYS201701), Fundamental Research Funds for the Central Universities (JUSRP51731B), Xinjiang Uygur Autonomous Region Key Development Project (2016B02025-1), Key Research and Development Project of Xinjiang Uygur Autonomous Region (2017B02011), Henan collaborative innovation of textile and clothing industry (hnfz14002), Prospective industry-university-research project of Jiangsu Province (BY2016022-27), the Natural Science Foundation of Jiangsu Province (BK20170169), Suqian Industry Support Project (H201612, H201607), and a project funded by the Priority Academic Program Development of Jiangsu Higher Education Institutions (PAPD).

References

1. Hunter L. Mohair, cashmere and other animal hair fibers [M]. Woodhead Publishing, 2012.
2. HU J. Thoughts on the development of farmer's specialized cooperative [J]. Rural Economy 2005; (8): 123-125.
3. Stoves J L. Principles of fur dyeing [J]. Journal of the Society of Dyers and Colourists 1976; 92(6): 213-226.
4. Bereck A. Bleaching of pigmented speciality animal fibers and wool [J]. Review of progress in Coloration and Related Topics 1994; 24(1): 17-25.
5. Jianfei L J H J Z. Researching of absorbing parameters of coloured wool with Fe^{2+} (in Chinese) [J]. Journal of Tianjin Institute of Textile Science and Technology 1997; 1: 59-63.
6. Earland C, Little A S. The bleaching of naturally pigmented cashmere with hydrogen peroxide [A]. in International Wool Textile Research Conference [C] 1985; 130-140.
7. Laxer G, Whewell C S. Adsorption of Metal Ions by Naturally Pigmented keratin Fibers [J]. Journal of the society of Dyer and Colourists 1953; 69(3): 83-84.
8. Khishigsuren A, Nakajima M, Takahashi M. Effect of ferrrous Mordanting on Bleaching of camel Hair [J]. Textile Research Journal 2001; 71(6): 487-494.
9. Khishigsuren A, Nakajima M, Takahashi M. Using sodium bisulfite as a rinsing Auxiliary in Bleaching Cashmere [J]. Textile Research Journal 2002; 72(1), 51-54.
10. Bereck A. Bleaching of Dark Fibers in Wool [A]. International Wool Textile Research Conference [C]. 1985; 152-162.
11. Giesen M, Zeigler K. Die Absorption von selective Gebleichter Wolle [J]. Melliand Textliber 1981; 62: 482-483.
12. Arifoglu M, Marmer W N. Sequential oxidative and reductive bleaching of stained and pigmented wool in a single bath [J]. Textile Research Journal 1990; 60(9): 549-554.
13. Arifoglu M, Marmer W N. Sequential oxidative/reductive bleaching and dyeing in a multi-component single liquor system. U.S. Patent 5, 264, 001 [P]. 1993-11-23
14. Trollip N G, Maasdorp A P B, van Rensburg N J J. A Study of the Mordant Bleaching of Karakul [A]. International Wool Textile Research Conference [C]. 141-151, 1985.
15. Montazer M, Zargaran M, Rahimi A. Depigmentation of pigmented wool [J]. Textile Research Journal 2009; 79(3), 261-267.
16. Chi-wai K, Kwong C, Chun-wah M Y. The possibility of low temperature plasma treated wool fabric for industry use [J]. AUTEX Research Journal 2004; 4(1): 37-33.
17. Lindberg J. Relationship between various surface properties of wool fibers Part II: Frictional properties [J]. Textile Research Journal 1953; 23(4): 225-236.
18. Bogaty H, Sookne A M, Harris M. The Felting of Wool as Related to the Elastic and Swelling Behavior of the Fiber [J]. Textile Research Journal 21 1951; (11): 822-826.
19. Dusenbury J H, Wakelin J H. Effects of Crimp and Cross-sectional Area on the Mechanical Properties of Wool Fibers [J]. Textile Research Journal 1958; 28(12): 989-1005.
20. Wengguang W. Wool Spinning Studies (Rudin) (in Chinese) [M]. Textile Industry Press,1990.
21. Xie C P, Gao W D, Liu X J, Su X Z, Zhu Y K. A new kind of Complete condensing Spinning system with strip groove structure [J]. Journal of Textile Research 2013, 6: 137-141.
22. Liu X, Hurren C J, Wang L, et al. Effects of Bleaching and Dyeing on the Quality of Alpaca Tops and Yarns [J]. Fibers and Polymers 2004, 5(2): 128-133.

Received 8.06.2017 Reviewed 14.06.2017