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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

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**Determination of the friction factor of short fibres - Capstan
method**

化学纤维 短纤维摩擦因数的测定 绞盘法

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Foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for standardization work Part

1. Structure and drafting rules for standardization documents" Drafting. Please note that some of the contents of this document may involve patents. The issuing organization of this document does not assume the responsibility for identifying patents. This document is proposed and coordinated by the National Technical Committee on Standardization of Chemical Fibers (SAC/TC586). This document was drafted by: Sinopec Yizheng Chemical Fiber Co., Ltd., Modern Textile Technology Innovation Center (Jianhu Laboratory), Tongkun Group Tuan Co., Ltd., Chuzhou Xingbang Polymer Color Fiber Co., Ltd., Zhejiang Huilong New Materials Co., Ltd., Fujian Yijin Chemical Fiber Co., Ltd., Shanghai Textile Industry Technical Supervision Institute, Tangshan Sanyou Group Xingda Chemical Fiber Co., Ltd., China Chemical Fiber Industry Association, Yuyao Dafa Chemical Fiber Co., Ltd., Shaoshi Testing Technology (Shanghai) Co., Ltd., Xinfengming Group Co., Ltd., Nanjing Chemical Fiber Co., Ltd., Jiangsu Xinshi World Advanced Functional Fiber Innovation Center Co., Ltd., Hangzhou Benma Chemical Fiber Spinning Co., Ltd., Hebei Aikerui Fiber Co., Ltd., Zhejiang Light Industry Industrial Product Quality Inspection Institute. The main drafters of this document are: Ji Xuan, Chen Jianmei, Dai Junming, Sun Yanlin, Zhang Wenqiang, Shen Shunhua, Tong Lina, Wang Lili, Sun Zhengjun, Li Deli, Gu Jun, Ye Shiyi, Zhang Quanzhong, Zhou Mingji, Wang Lixia, Xu Guoliang, Wei Quandong, and Yang Yi.

Determination of Friction Factor of Chemical Staple Fibers Winch method

1 Scope

China's national method for determining the friction factor of short fibres by the capstan method. Friction between fibres is what makes a staple yarn possible at all: a yarn of short fibres holds together only because twist presses them against one another and friction resists their sliding apart, so the fibre's surface friction determines the yarn's strength directly. It also determines how the fibre behaves through every machine before that - carding, drawing, roving - where too little friction means the web falls apart and too much

means the fibres will not draft and the sliver breaks. The capstan method measures it by drawing a fibre bundle over a cylinder and comparing the tensions on each side, which gives the coefficient from the exponential relation that has described belt friction since Euler. The method applies to chemical fibre staple of cut length 30 mm or greater.

This document describes the determination of the friction factor of short fibres using the capstan method. This document is applicable to chemical fiber staple fibers with a cut length ≥ 30 mm.

2 Normative references

The contents of the following documents constitute the essential clauses of this document through normative references in this document. For referenced documents without a date, only the version corresponding to that date applies to this document; for referenced documents without a date, the latest version (including all amendments) applies to This document.

GB/T 3102.3-1993 Quantities and units in mechanics

GB/T 4146 (all parts) Textiles - Chemical Fibers

GB/T 8170 Rules for rounding off values and expression and determination of limit values

GB/T 9994 Standard moisture regain of textile materials

3 Terms and definitions

GB/T 4146 (all parts), GB/T 3102.3-1993 and the following terms and definitions apply to this document.

3.1 Static friction factor μ_s The maximum ratio of friction to normal force on a stationary object. [Source: GB/T 3102.3-1993, 3-22.2] 3.2 μ_d The ratio of the friction force to the normal force on a sliding object. [Source: GB/T 3102.3-1993, 3-22.1, modified]

4 Principle

Under specified conditions, a fixed tension f_0 is applied to both ends of the fiber. The fiber is straddled on the friction roller and the fiber and the friction roller are kept in contact. The surrounding angle $\theta = \pi$, and then hang one end of the fiber on the hook of the force sensor. When the friction roller rotates, one end is tight and the other end is loose. The friction force f_2 is measured by the force sensor. According to Euler's law, the friction coefficient between the fiber and the friction roller surface is calculated. Friction coefficient test The principle diagram is shown in Figure 1.