

Development of Non-Twisted Wrapping Silk Yarn

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We developed a new yarn material consisting of non-twisted raw silk (size: 27d x 2) and nylon 66 (12d), using the different shrinkage characteristics of fibers. The non-twisted raw silk used as a core filament was covered with the nylon fiber. The sericin layer of the nylon-covered raw silk was removed, or degummed, with a Marseilles solution at 70-105 degrees centigrade for 70 min. The nylon fiber shrank by heat while the raw silk became soft and voluminous under the degumming conditions. This morphological change was due to the effect of different shrinkage rate. A microscopic study demonstrated that the nylon fiber shrunk becomes virtually a core filament and fixes the silk fiber firmly at regular intervals while the silk fiber loosens and curls into a helix, wrapping the nylon fiber. This new yarn was designated non-twisted wrapping silk yarn or NT-WS. It was also demonstrated that the nylon fiber plays an important role in keeping NT-WS from becoming a rough fibrous surface. These properties enabled high-speed weaving, thus improving productivity of silk fabric. The combination of non-twisted raw silk and nylon 66 was essential to produce NT-WS because Nylon 66 provided the proper shrinkage rate, but tightly-twisted raw silk, whose twists prevented the silk fiber from loosening, was not suitable for producing wrapping silk yarn. Based on the Kawabata Evaluation System for Fabrics (KES-FB), fabrics made from NT-WS were highly crease recovering and abrasion resistant as well as machine washable. NT-WS fabrics have high air-trapping ability mainly due to the high fiber dynamics of NT-WS. Thus it is concluded that NT-WS can be used for creating soft silk fabrics featuring excellent ability to retain warmth.