

# A study on preparation and mechanical properties of UHMWPE/NYLON wrap yarn

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## Abstract

The preparation of UHMWPE/NYLON wrap yarn which is composed of ultra-high molecular weight polyethylene (UHMWPE) filament and nylon filament was fabricated via hollow spindle machine. Among the UHMWPE filament (Spectra 1000) which was purchased from Honeywell of USA was treated as core filament and the nylon filament which was purchased from factory of Taiwan was treated as sheath yarn. The mechanical properties of UHMWPE/NYLON wrap yarn were investigated through experiments of evenness, wrap yarn denier, tensile strength, tensile tenacity, tensile elongation and tensile strain. The properties of tensile strength, tensile tenacity, tensile elongation and tensile strain of UHMWPE/NYLON wrap yarn were tested by tensile testing frame; for the wrap yarn denier of UHMWPE/NYLON wrap yarn was experimented by accurate balance, a vacuum oven and calculated by direct system formula of yarn count and the wrap yarn qualities of evenness (U% or CV%) was measured by Uster Testing Instrument. The wrap nylon denier, nylon type and wrap number of nylon filament around onto UHMWPE filament (degree of twist, TPM) were chosen as the experiment's parameters in this study, Meanwhile, the parameters of nylon filament denier is chosen the both of 40D and 70D, nylon type is chosen the both of nylon6,6 and a nylon6; and twist degree is chosen from 700TPM to 1000TPM (turn per meter). The resulted properties of UHMWPE/NYLON wrap yarn are indicated that the U% and CV% of yarns evenness aren't affected by those parameters and always kept below 3%. The denier of wrap yarn was increased with the increase of denier and twist

degree of wrap nylon. The tensile strength was also increased with the increase of denier and twist degree of wrap nylon and the wrap nylon66 was higher tensile strength than wrap nylon6. For the tensile strength of UHMWPE/NYLON wrap yarn, the tensile tenacity was decreased with the increase of wrap nylon denier, when wraps nylon 40 deniers, the tensile tenacity was kept constant with wrap in any nylon type, and twist degree, whereas wrap nylon 70 deniers, the tensile tenacity was increased with increasing of twist degree in both of wrap nylon6 or nylon66. For the elongation and elongation% (tensile strain) of wrap yarn were shown to increase with increasing both of denier and twist degree of wrap nylon, this phenomena was more obviously wrap nylon 40 deniers than wrap 70 deniers, whereas there was not difference between wrap nylon6 and nylon6,6.affected the elongation and elongation% (tensile strain) of wrap yarn

In summary, the UHMWPE filament was wrapped with nylon to fabricate the UHMWPE/nylon warp yarn via hollow spindle frame, although the tensile strength of UHMWPE/Nylon wraps yarn would be decreased, in contrast with UHMWPE filament, the UHMWPE/Nylon wraps yarn is a great tensile elongation and tensile strain as well as the dyeing and the weaving would be improved; The optimum parameters to prepared UHMWPE/Nylon wraps yarn is chosen nylon66, 70D and 1000TPM respectively.

**Key word: UHMWPE/nylon wraps yarn, mechanical property, tensile tenacity, U%.**