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Industrial Member Report Summary – Key Findings for Industry

Laser Surface Processing to Alter the Elastic Properties of Nylon-Elastane Fabrics: an Initial Study

TWI Core Research Programme

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Industrial need

The elastic properties of fabrics are important in many applications including garments for sports training and competition, and for medical products, which rely on control of compressive forces over defined locations on the body. Garments with modified elastic properties are used for treatment after surgery and to reduce deep vein thrombosis. Approaches to manufacturing compressive garments include sewing different fabrics together, lamination of additional layers in selected locations, complex weave or knitted patterning and application of patterns of adhesive dots or coatings to the fabric surface. This work aimed to identify the potential for using the laser beam melting method to modify the elastic properties of fabrics. It would allow easy control of the pattern and amount of surface melting, and should be applicable to small or larger areas of the fabrics or garments.

Key Findings

Studies into direct diode laser surface treatment of elasticated nylon fabrics, and the effect on the elastic properties of those fabrics has resulted in the following main conclusions:

- Variations in laser processing conditions (power, process speed, and beam spot size) have been shown to demonstrate a controlled effect on the surface of the fabric and the elastic properties. Surface melting and elastic modulus increased at higher heat input processing conditions.
- Varying the distance between and orientation of melted lines or using the laser in a pulsed mode allowed control of the elastic properties of the fabric as a whole, including the magnitude and direction of the changes in elastic properties.
- Surface melting has a negative effect on the tensile strength of the fabric; however, pulsing and heat input variables have been demonstrated as methods that can be used to mitigate this effect.
- Laser beam melted patterns have a significant compressive effect on the surface of the human body; reducing body measurements by 1-2% and increasing pressure values by approximately 60% across all areas tested.

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