UNIVERSITI TEKNOLOGI MARA

STRESS-STRAIN RESPONSE ON THE 3D ANGLE INTERLOCK WOVEN FABRIC POLYMER COMPOSITE

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ABSTRACT

Textile woven materials are widely used as woven composite to replace steel due to the strength-weight ratio factor on certain reinforcement application such as aerospace, transportation, defence, and sports. 3D woven fabric have enticed many researchers around the world to explore the potential mechanical tensile strength performance area particularly on 3D angle interlock (3DAI) woven fabric. The aim of this research are to analyse the relationship between stress-strain properties of 3DAI with different weft densities and draw-in plan and to establish the correlation between 3DAI woven fabric and composite stress with different weft densities and draw-in plan. 3DAI woven fabric samples were manufactured by using a Sulzer rapier loom based on different fabric set-up parameters such as draw-in plan (DRW); DRW 1 – 4 and variation number of weft densities; 14, 18, 22, 25 pick.cm-1. Later, a BJC-39 epoxy resin and hardener were used to fabricate the 3DAI woven composite through a hand lay-up approach. 3DAI woven fabric and composite samples were evaluated based on the fabric physical properties of fabric weight, thickness, crimp presence, and uniaxial tensile stress-strain properties. The increment value of weft densities from 14 to 25 pick.cm-1 indicated positive improvement of mechanical tensile stress-strain behaviours both on woven fabric and composite samples. It were noticed that, DRW 1 and 4 displayed with higher result of fabric cover factor, fabric weight, fibre volume fraction, and tensile stress-strain properties compared to the other counterparts, DRW 2 and 3. Besides that, a statistical partial correlation analysis was performed by using IBM SPSS software. The statistical partial correlation outcomes between fabric physical properties and tensile stress performance of 3DAI woven fabric and composite indicated that fabric weft crimp physical and different draw-in plan (DRW) variables shown the most contribution towards the tensile stress of 3DAI woven fabric.

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