DEVELOPMENT OF HYBRID 3D WOVEN STRUCTURES FOR CONCRETE REINFORCEMENT UNDER IMPACT LOADING

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Abstract: Steel reinforced concrete (RC) is widely used in the construction industry for its great strength, durability, and versatility, specially under static loading. Nonetheless, the materials resilience under highly dynamic events, e.g. impact, is particularly low. The research training group DFG GRK 2250, aims to significantly improve impact energy absorption of existing infrastructures by applying thin layers of an innovative strengthening material (mineral-bonded composite), composed of a strain-hardening short fiber reinforced concrete (SHCC) and a 3D woven reinforcement [1, 2].

This conference paper explores the challenges and solutions of a novel weaving technology for the manufacturing of hybrid cellular spatial structures for concrete applications under impact stress. A modified rapier weaving machine (Dornier HTVS4) allows for the processing of round and flat stainless-steel wires in combination with profiled carbon rovings [3, 4]. The synergy between the ductility of steel and the high tensile strength of carbon fibers has shown to be an ideal material choice to improve the impact resilience of such structures [5, 6]. Furthermore, through improvements in the technology and the structural design, carbon fiber tow prepregs could be implemented in warp direction. Thus, fully utilizing the potential of the weaving technology and transform the so far mono-axially designed structure into a bi-axially architecture.

***Keywords**: cellular metals, concrete reinforcement, hybrid structure, impact resistance, weaving technology.*

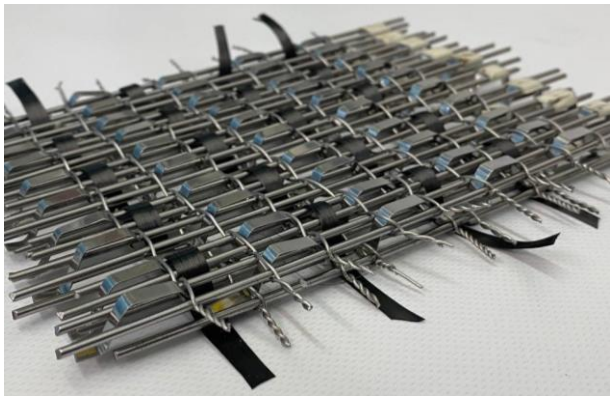

Figure 1: Hand sample of the novel 3D woven reinforcement.

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