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Title Page**Matching Effect of Honeycomb-filled Thin-Walled Square Tube****—Experiment and Simulation**

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Abstract—Honeycomb-filled thin-walled square tube (HFST) structure is a new outstanding *energy* absorption component, which has attracted great attention in recent years. This paper aims to present a comprehensive investigation by means of both experiments and numerical simulations. Detailed mechanical and energy absorption properties have been determined for kinds of HFST structures with different geometric configurations. Matching relationships between inside honeycomb core and outside metallic thin-walled structures have been observed. Parametric simulations by means of cell expansion numerical simulation methodology have been carried out to further understand the matching effect. The deformation mode evolution of filling has been determined, together with key influence factors on such a matching effect. Results show that the geometric configuration, the matrix material properties as well as the impact velocity have significant influence on the matching relationships.

Keywords: Honeycomb; Filling structure; Matching effect; Cell expansion method

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