Crushing analysis for novel bio-inspired hierarchical circular structures subjected to axial load

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Highlights

- A new bio-inspired hierarchical circular tube (HCT) is proposed to enhance structural crashworthiness.
- Hierarchical structures exhibit significant crashworthiness advantages than non-hierarchical structures.
- The diameters of sub-circle and the wall thickness have remarkable effect on the crashworthiness.
- The theoretical model can predict well the energy absorption and MCF for 2^{nd} order HCT.
- The optimal hierarchical structures are obtained by the multi-objective optimization design method.