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Experimental investigation on cenosphere-aluminum syntactic foam-filled tubes under axial impact loading

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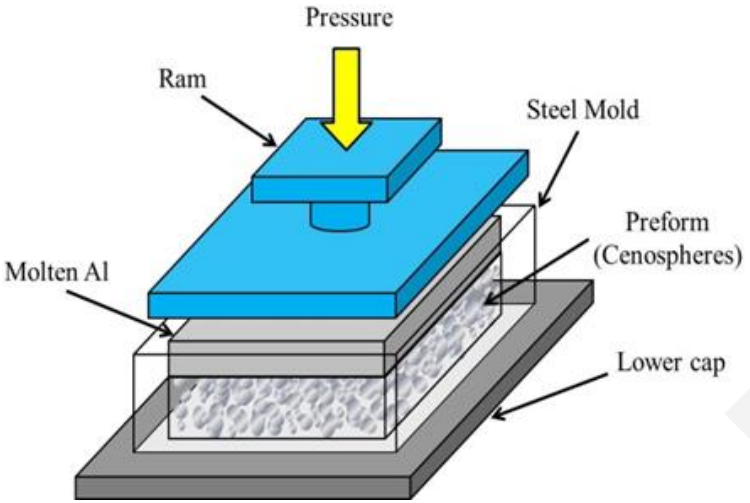
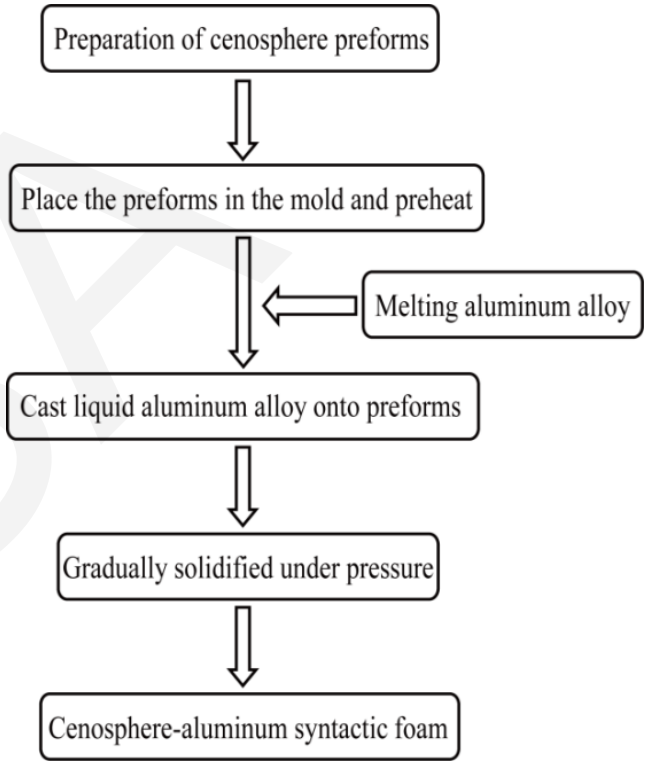
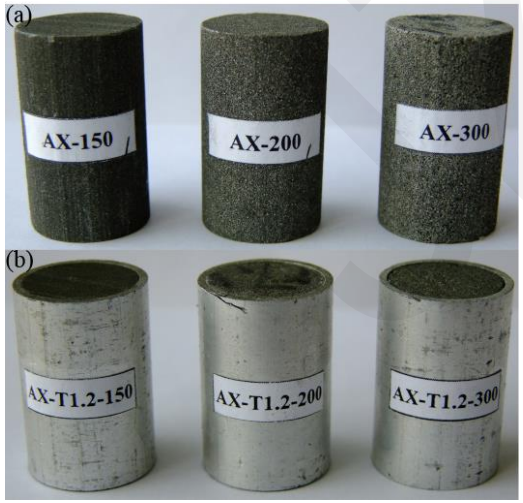
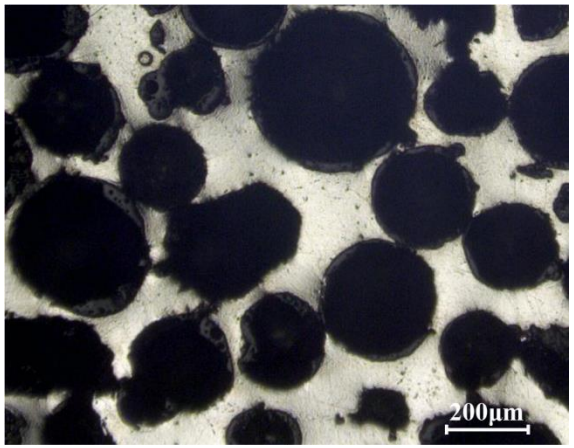
Materials


Pressure
Ram
Steel Mold
Preform
(Cenospheres)
Molten Al
Lower cap


Preparation of cenosphere preforms
Place the preforms in the mold and preheat
Melting aluminum alloy
Cast liquid aluminum alloy onto preforms
Gradually solidified under pressure
Cenosphere-aluminum syntactic foam

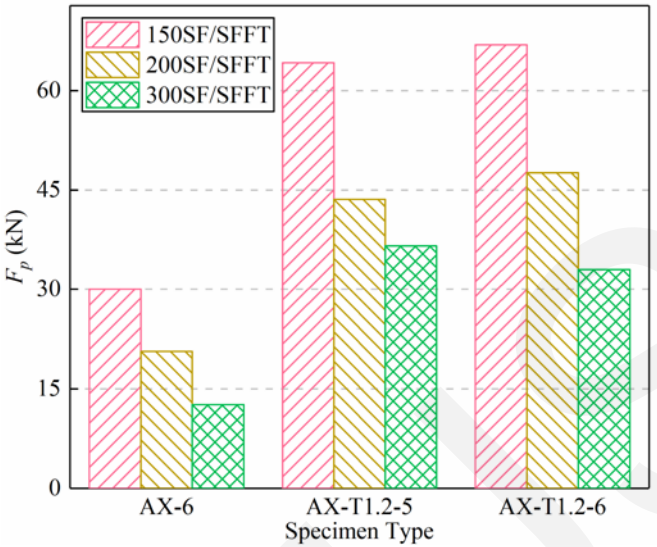

(a)
AX-150
AX-200
AX-300
(b)
AX-T1.2-150
AX-T1.2-200
AX-T1.2-300



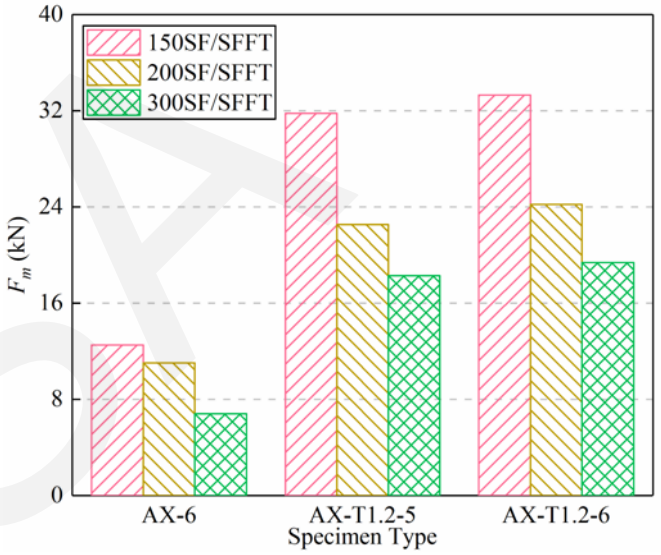

200μm

Evaluation Indicators

Mechanics

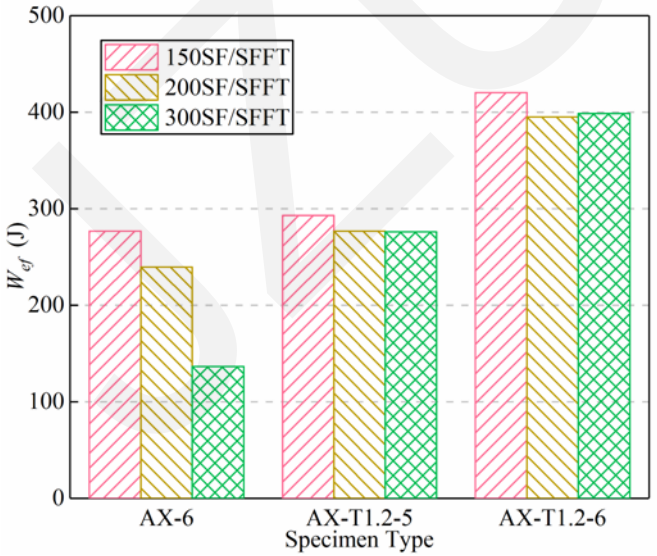


■ Peak crushing loading

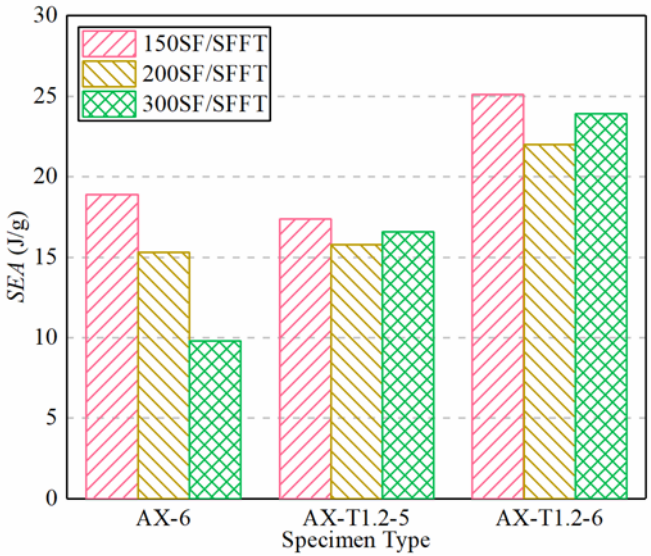


■ Mean crushing loading

Energy Absorption

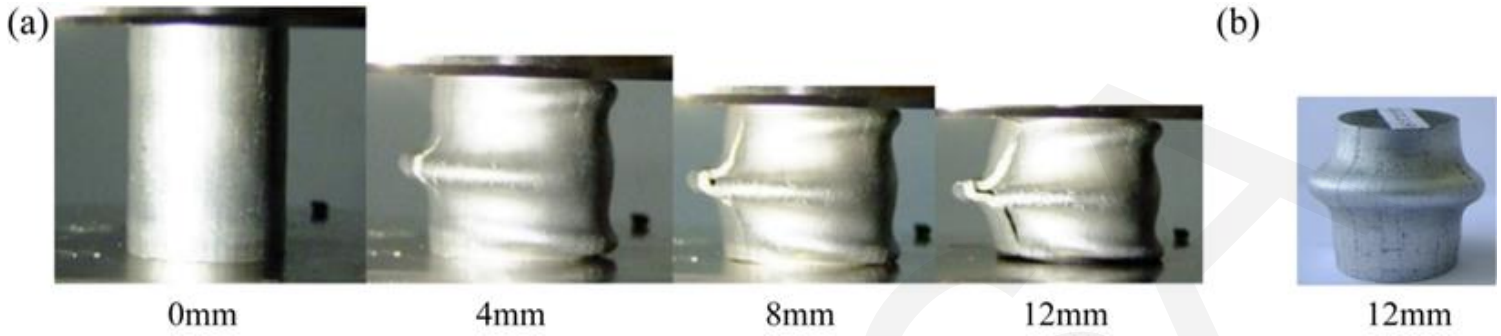


■ Effective energy absorption

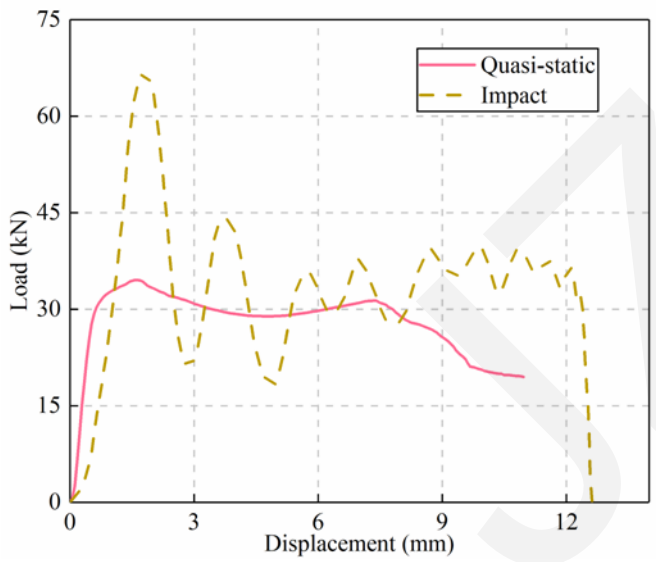


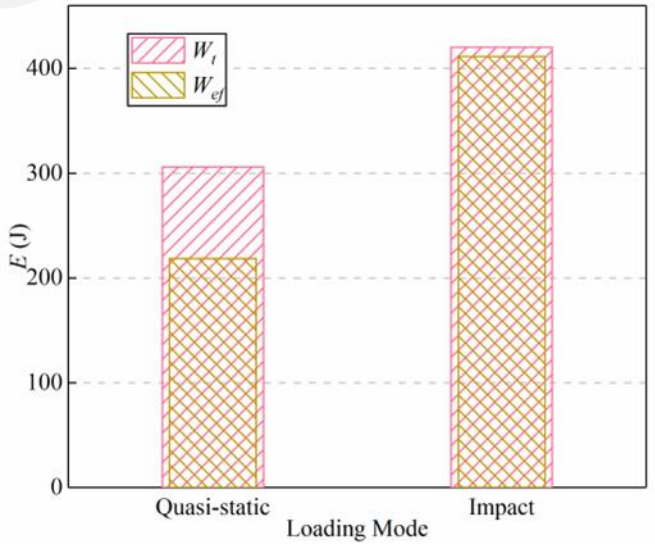
■ Specific energy absorption

Comparison



- Quasi-static loading
- Impact loading





- Load-displacement curve
- Effective energy absorption ratio

Conclusions

- Three kinds of syntactic foam-filled tubes buckled outwards in a **concertina mode** under impact loading.
- The SEA of all cenosphere-aluminum syntactic foam-filled tubes under two impact velocities was higher than **15 J/g**, and the SEA of 150SFFT reached **25 J/g**.
- The stress level of the material was increased under the impact loading, so the effective energy absorption ratio of the specimen reached **97.8%**.

Published related articles

- Li Wang, Boyi Zhang*, Jian Zhang, Yuexin Jiang, Wei Wang, Gaohui Wu, "Deformation and energy absorption properties of cenosphere-aluminum syntactic foam-filled tubes under axial compression", Thin-Walled Structures, vol 160, 2021, 107364.

- Boyi Zhang*, Li Wang, Jian Zhang, Yuexin Jiang, Wei Wang, Gaohui Wu, "Deformation and energy absorption properties of cenosphere/aluminum syntactic foam-filled circular tubes under lateral quasi-static compression“, International Journal of Mechanical Sciences, vol 192, 2021, 106126.