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Fracture of soft cellular solids

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弾性率が1MPa程度のとてもやわらかいセル固体（多孔質物質）の破壊エネルギーを有限サイズ効果なしに直接測定した。非架橋ポリエチレン(PE)フォームに対する系統的な実験から、ヤング率、破壊エネルギー、応力拡大係数と固体分率（あるいは発泡倍率）の間のスケーリング法則を得た。この法則は従来知られていた弾性率が3000MPa以上の場合と異なっているが、シンプルに説明することができる。また、ポリウレタン(PU)フォームについて行った同様の実験の結果についても触れる。

We measured directly the fracture surface energy of soft cellular solids (porous materials) of the Young modulus E around 1MPa, with removing finite size effects. From a systematic tests on non-crosslinked polyethylene (PE) foam (Fig.1), we obtained dependences of Young modulus, fracture energy, and stress intensity factor on solid fraction. These relations differ from what have been known for hard cellular solids of E larger than 3000MPa but can be interpreted by simple notions [1]. We also mention similar tests performed on crosslinked polyurethane foam (Fig.2).

Figure 1: Surface of the PE foam sheet (closed cell).

Figure 2: Surface of the PU foam sheet (open cell).

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References

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