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Dr. Yapa Rajapakse and Prof. Yasushi Miyano

# MECHANICAL PROPERTIES OF AN AUXETIC POLYURETHANE FOAM COMPOSITE

Chiang F.P.\*, Ding Y.\* [Chiang F.P]: fu-pen.chiang@stonybrook.edu  
 \*Stony Brook University

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## Abstract

Introduced in 1987 [1], Auxetic material has the unusual property of having a negative Poisson's ratio and it attracted more and more attentions of many researchers and investigators [2-10]. Fig.1.a and Fig.1.b show the typical mechanical responses of auxetic and conventional composites under uniaxial tension test. As a result it has several advantages over the conventional ones as a ship-building material. An auxetic thin plate deflects much less than a conventional plate for a given load [11]. It reduces acoustic noise due to its lower cut-off frequency [12]. It resists better indentation and low velocity impact damages [13-14]. When bent it deforms synclastically rather than anticlastically thus rendering it ideally suitable for forming into convex-convex surfaces [15]. Furthermore it resists shear failure due to the resulting large shear modulus. In this paper we present the process of manufacturing an auxetic composite from an ordinary polyurethane foam. We characterized the mechanical properties of the resulting material and exploited its use as a core material for sandwich panels for marine construction. Fig. 2 and 3 depict the typical stress strain curves and Poisson's ratios of auxetic material.

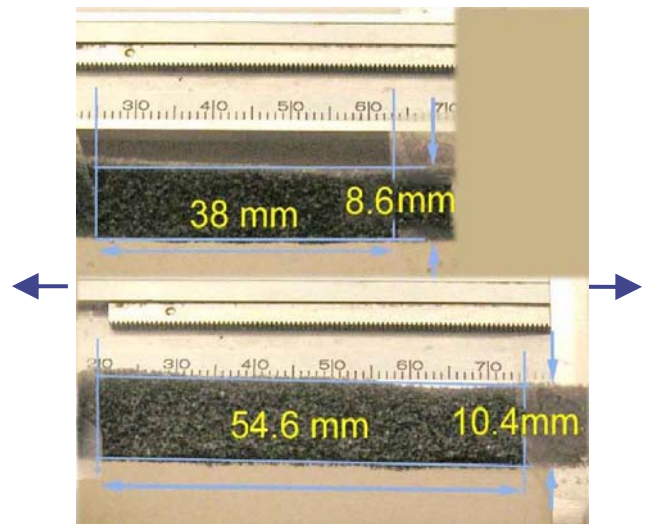


Figure 2.b Mechanical response of auxetic foam under uniaxial tension

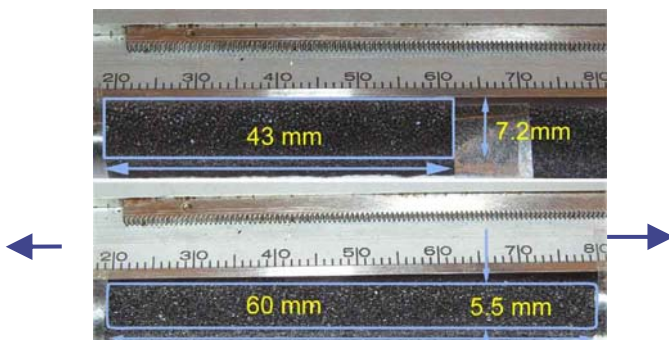


Figure 1.a Mechanical response of conventional foam under uniaxial tension

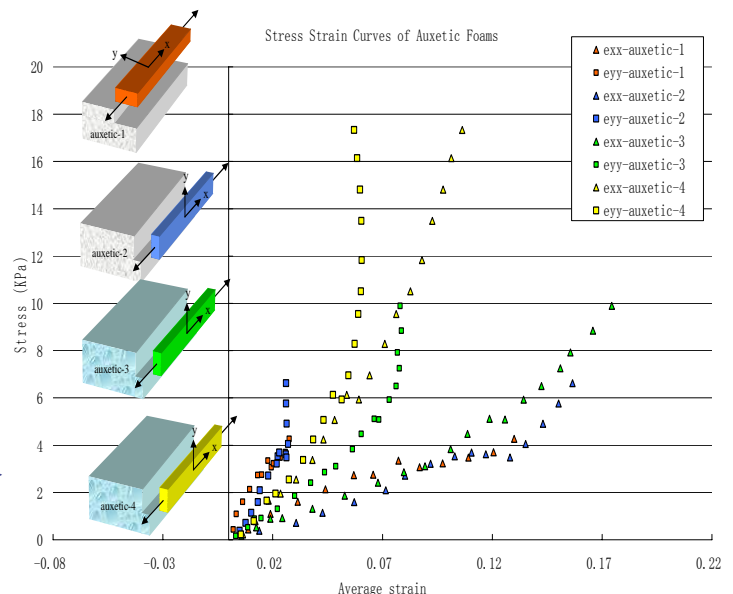


Figure 1 Stress – strain curve of auxetic foam specimens

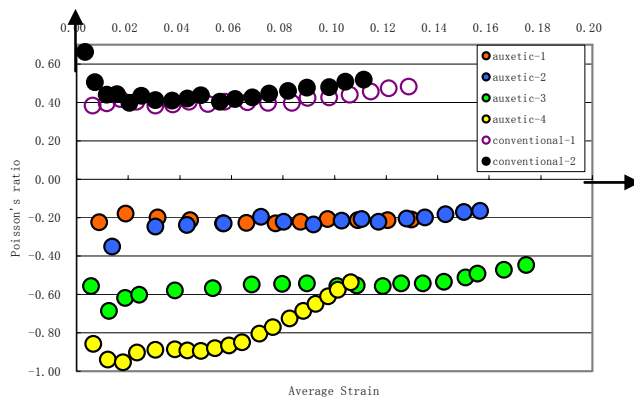


Figure 3 Poisson's Ratios of the Conventional & Auxetic Foam

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