# Supplementary Information

# Auxetic Laminar Composites Based on P(VDF-TrFE) for Enhanced Piezoelectric Performance in Flexible Energy Devices

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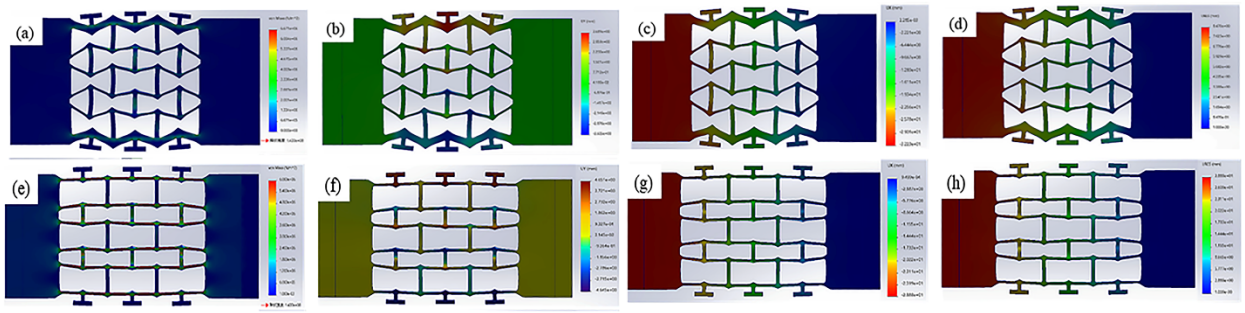


**Figure S1.** FEA results for tensile structures at monomer angles: 55° (a–d), 60° (e–h). Outputs: (a, e) von Mises stress; (b, f) Y-displacement; (c, g) X-displacement; (d, h) total displacement.

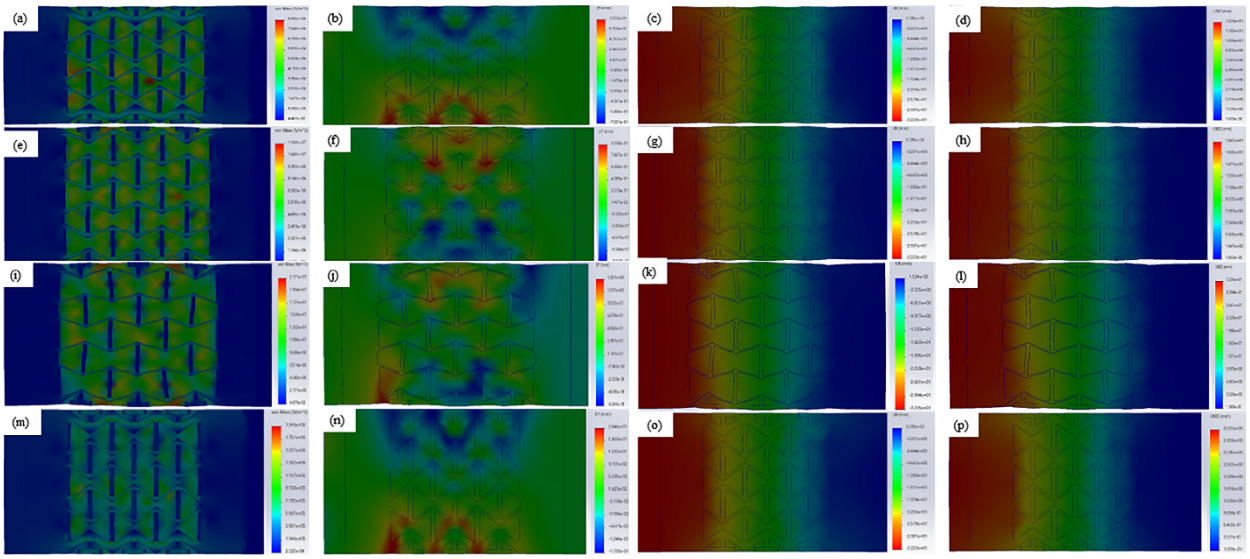


**Figure S2.** Simulation of films at angles 55°, 60°, 65° for both materials: P(VDF-TrFE) and P(VDF-TrFE-CTFE). Outputs: stress, X/Y displacement, total displacement across multiple sub-angles.

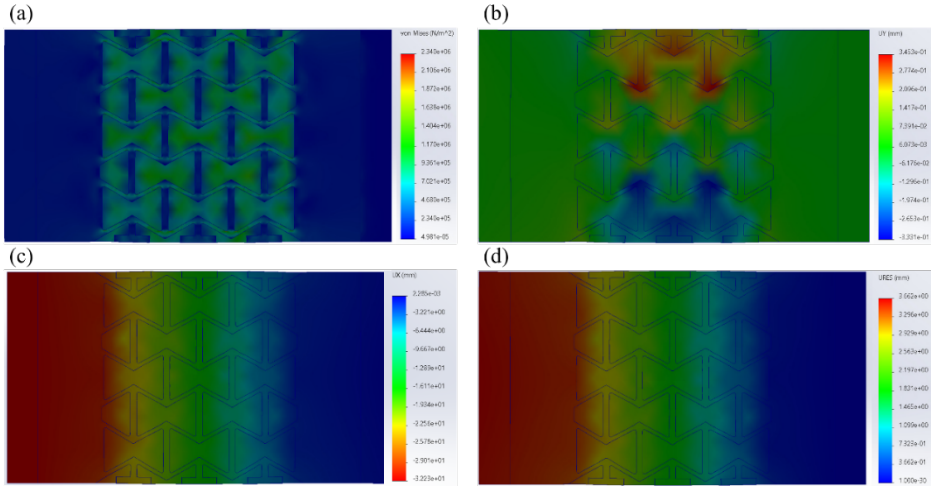


**Figure S3.** Simulation of P(VDF-TrFE-CTFE) film under biaxial tension at 60°: (a) stress distribution, (b) Y-displacement, (c) X-displacement, (d) total displacement.

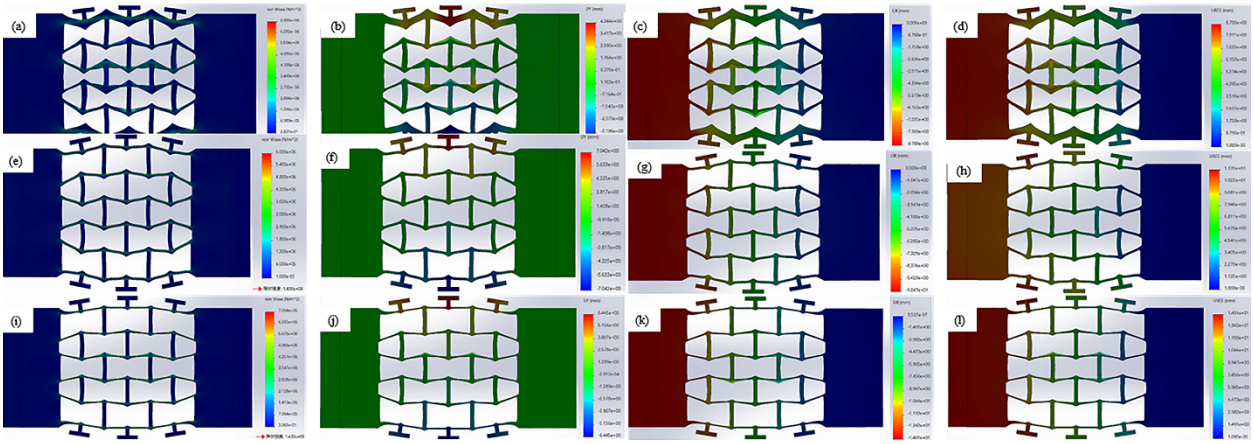

**Figure S4.** FEA of 5 mm-thick structures at 55°, 60°, 65° monomer angles: (a–d) 55°, (e–h) 60°, (i–l) 65° with von Mises stress and displacement results.

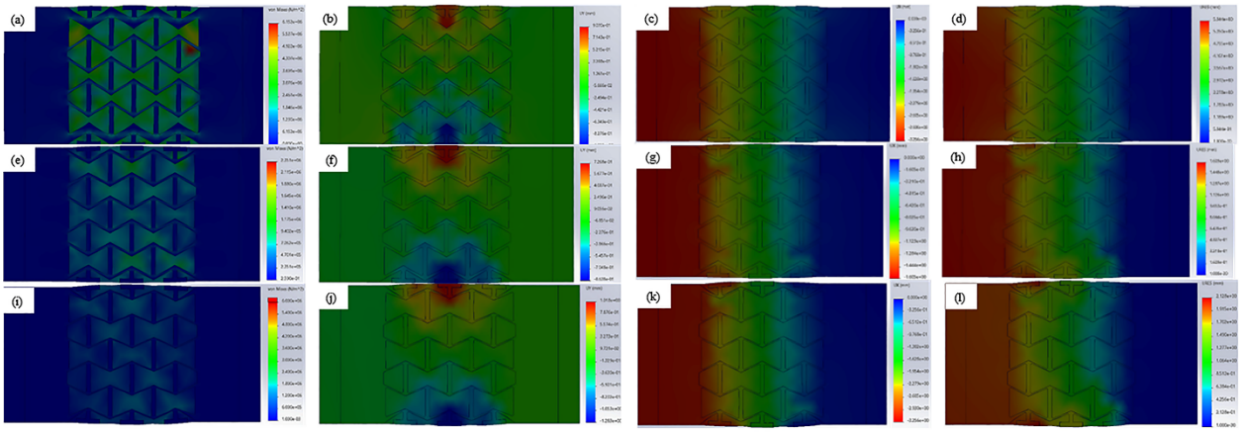

**Figure S5.** P(VDF-TrFE-CTFE) composites with 5 mm substrate under tension: FEA outputs at monomer angles 55°, 60°, 65° — stress and displacement maps.

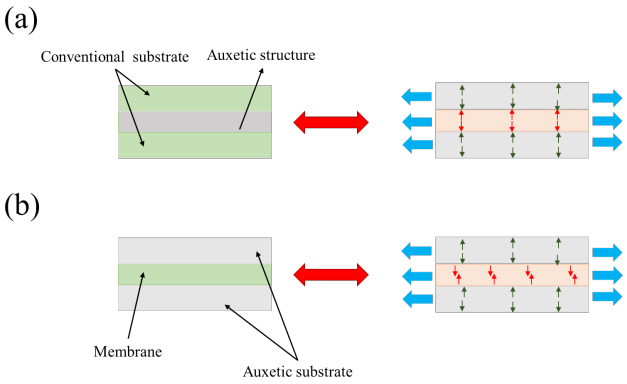

**Figure S6.** Interface behavior: (a) Literature model from Mohammad et al.; (b) Experimental observation from current study.

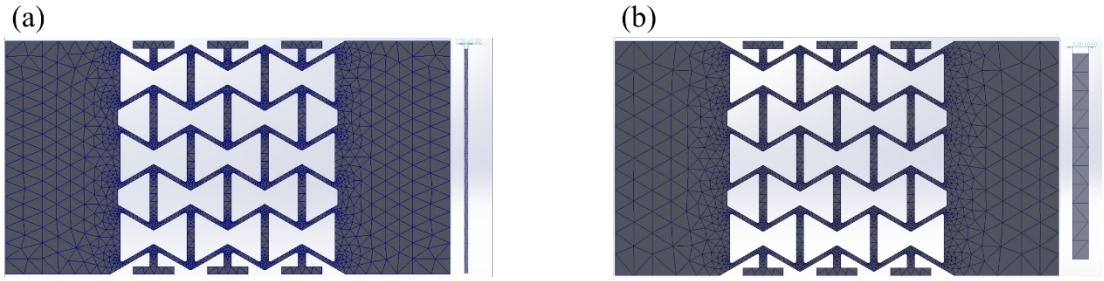


**Figure S7.** Mesh model. (a) Model with a thickness of 1 mm; (b) Model with a thickness of 5 mm

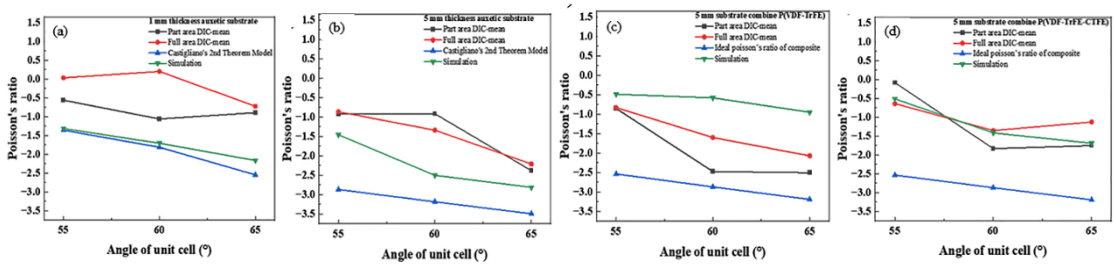


**Figure S8.** DIC-based strain vs. Poisson's ratio and center deformation: (a) Poisson's ratio curve; (b–d) central strain maps at 55°, 60°, 65°.

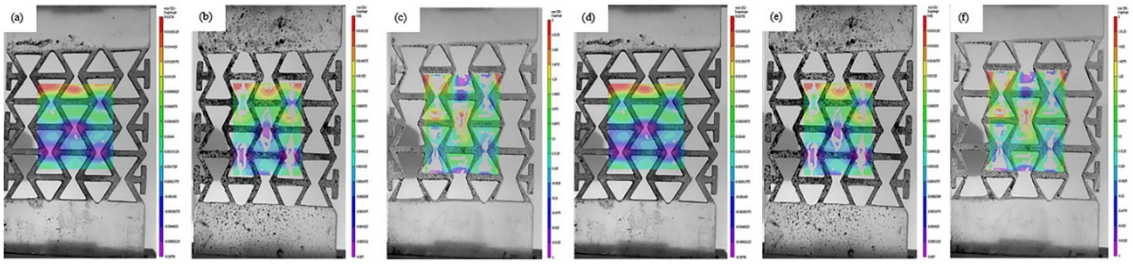


**Figure S9.** Poisson's ratio derived from DIC at various monomer angles: (a) 1 mm substrate; (b) 5 mm; (c) P(VDF-TrFE) composite; (d) P(VDF-TrFE-CTFE) composite.

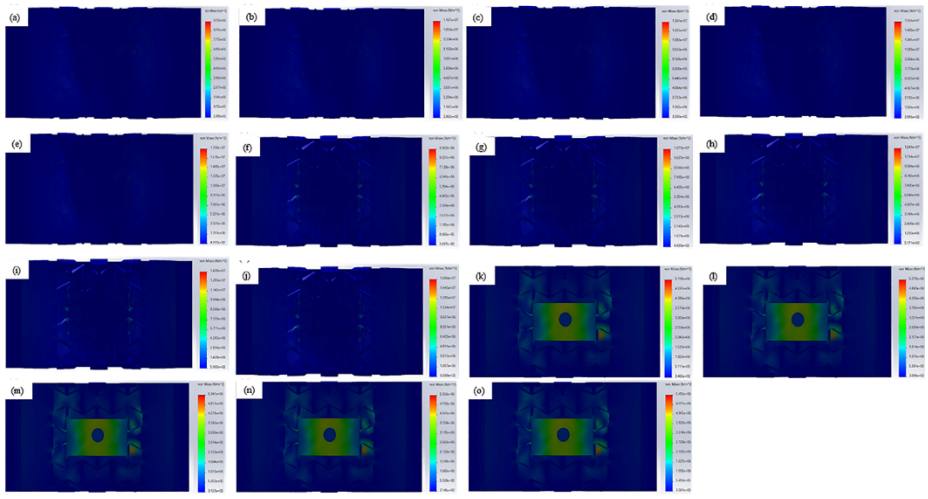

**Figure S10.** Simulated von Mises stress in P(VDF-TrFE-CTFE) composites under loads 25–45 N at 55°, 60°, 65°: (a–e) 55°, (f–j) 60°, (k–o) 65°.

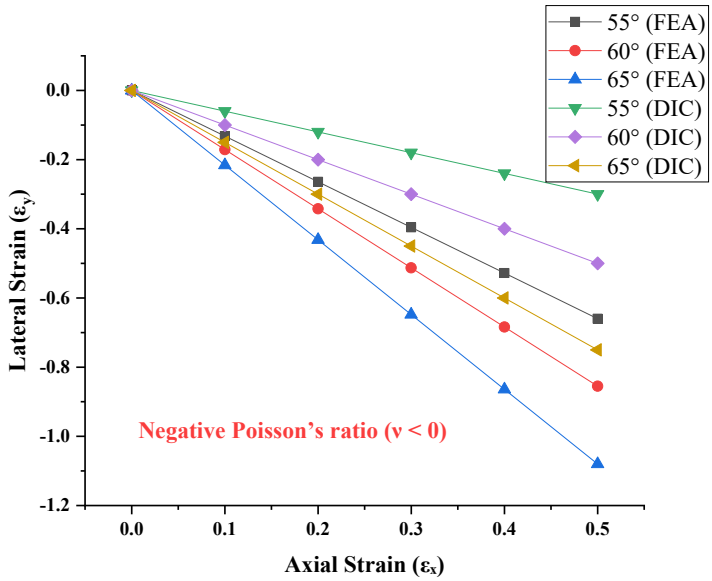


**Figure S11.** Relationship between lateral strain ($\varepsilon_y$) and axial strain ($\varepsilon_x$) for FEA and DIC results at monomer angles of 55°, 60°, and 65°, confirming negative Poisson's ratio ($\nu < 0$) behavior.