Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Bio-inspired design of geometrically interlocked 3D printed joints.[1] S KUMAR[2], NOEL OLIVA[3], Masdar Institute, Abu Dhabi, KUMAR'S LAB TEAM — The morphology of the adhesive-adherend interface significantly affects the mechanical behavior of adhesive joints. As seen in some biocomposites like human skull, or the nacre of some bivalve molluscs' shells, a geometrically interlocking architecture of interfaces creates toughening and strengthening mechanisms enhancing the mechanical properties of the joint. In an attempt to characterize this mechanical interlocking mechanism, this study is focused on computational and experimental investigation of a single-lap joint with a very simple geometrically interlocked interface design in which both adherends have a square waveform configuration of the joining surfaces. This square waveform configuration contains a positive and a negative rectangular teeth per cycle in such a way that the joint is symmetric about the mid-bondlength. Both physical tests performed on 3D printed prototypes of joints and computational results indicate that the joints with square waveform design have higher strength and damage tolerance than those of joints with flat interface. In order to identify an optimal design configuration of this interface, a systematic parametric study is conducted by varying the geometric and material properties of the non-flat interface.

[1]This work was supported by Lockheed Martin (Award No: 12NZZ1)
[2]Professor
[3]Graduate Student

S Kumar
Masdar Institute, Abu Dhabi

Date submitted: 24 Nov 2015 Electronic form version 1.4