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Introduction
Stretchable electronics is a new field aiming to enable a range of bio-compatible futuristic devices (Fig. 1-2). The designs of these devices typically consist of regular electronic components interconnected with metal lines made stretchable by design, (Fig. 3a) embedded in a stretchable (rubber) matrix material.

Many design solutions can be found in literature, one of which is the horseshoe shape interconnect. However, interface delamination is a common precursor to failure in all designs (Fig. 3c).

Goal
Understanding the delamination micro-mechanics responsible for the interface toughness. This knowledge can be applied to all interconnect designs to increase their stretchability.

Experiments
Four types of peel-test experiments are performed to investigate the characteristics of interfaces with two types of roughness in two opening modes. Moreover, the delamination front is visualized with in-situ ESEM imaging.

Conclusions
- In-situ ESEM imaging revealed a complex mechanism, which is the dominating dissipation mechanism
- The roughness initiates and controls the fibrillation process
- The fibrils and large surface roughness cause these interfaces to be insensitive to the crack opening mode, due to the “local” mode-mixity in the roughness morphology and the orientational freedom of the fibrils.
- Future designs of stretchable electronic devices should aim to initiate the fibril process, with an artificial "tailored" roughness.