GROWTH OF INTERFACE CRACKS ON CONSECUTIVE FIBERS: ON THE SAME OR ON THE OPPOSITE SIDES?

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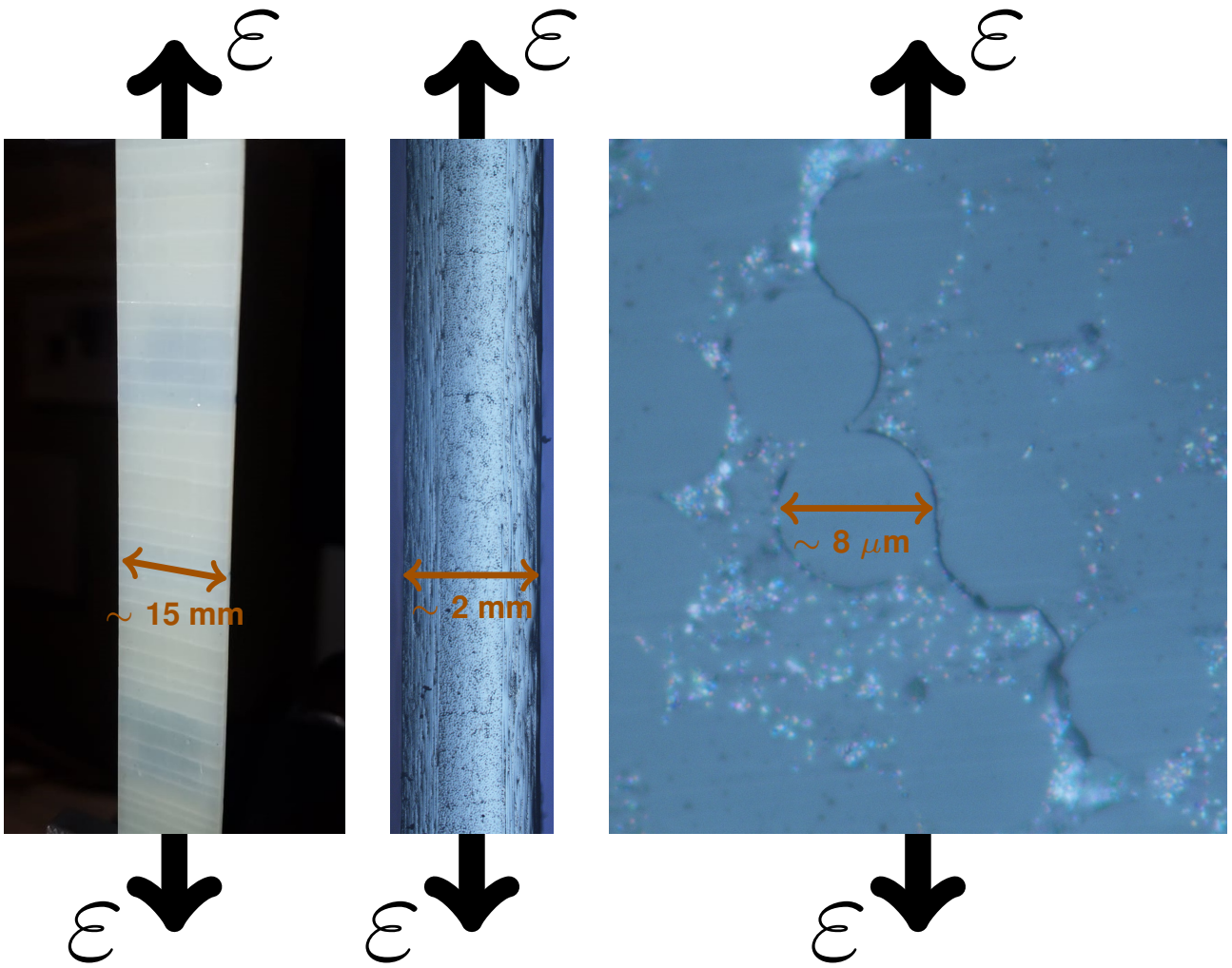
Outline

- Micromechanical Modeling of Initiation of Transverse Cracks
- Conclusions

↘ Micromechanical Modeling of Initiation of Transverse Cracks

Initiation of Transverse Cracking in FRPCs: Microscopic Observations



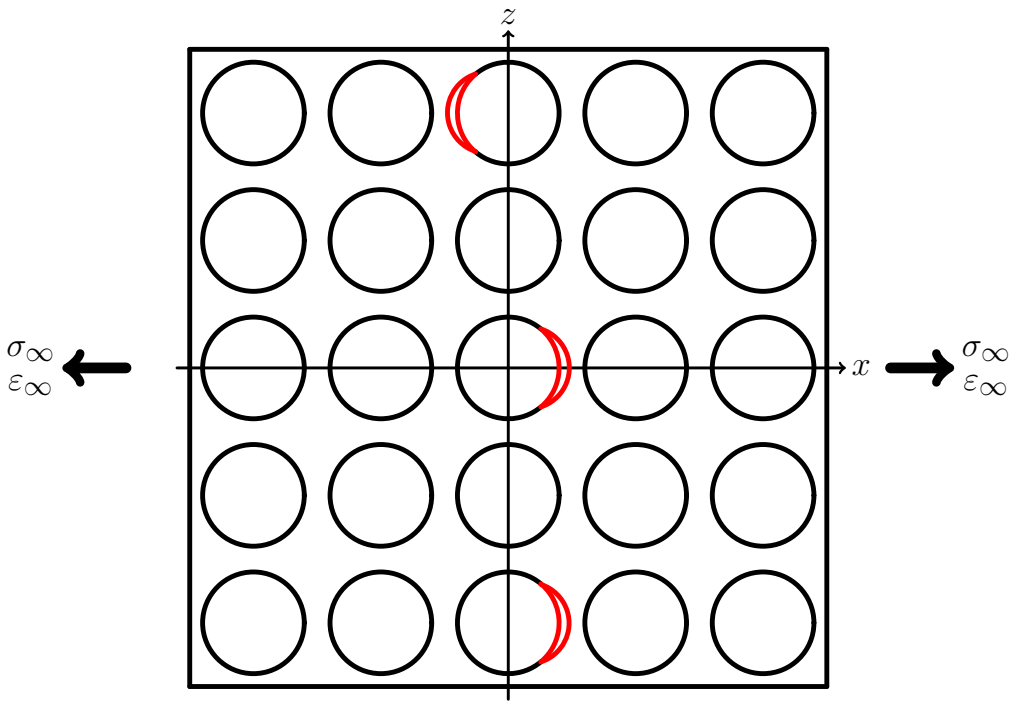
Left:
front view of $[0, 90_2]_S$, visual inspection.

Center:
edge view of $[0, 90]_S$, optical microscope.

Right:
edge view of $[0, 90]_S$, optical microscope.

Initiation of Transverse Cracking in FRPCs: Micromechanics

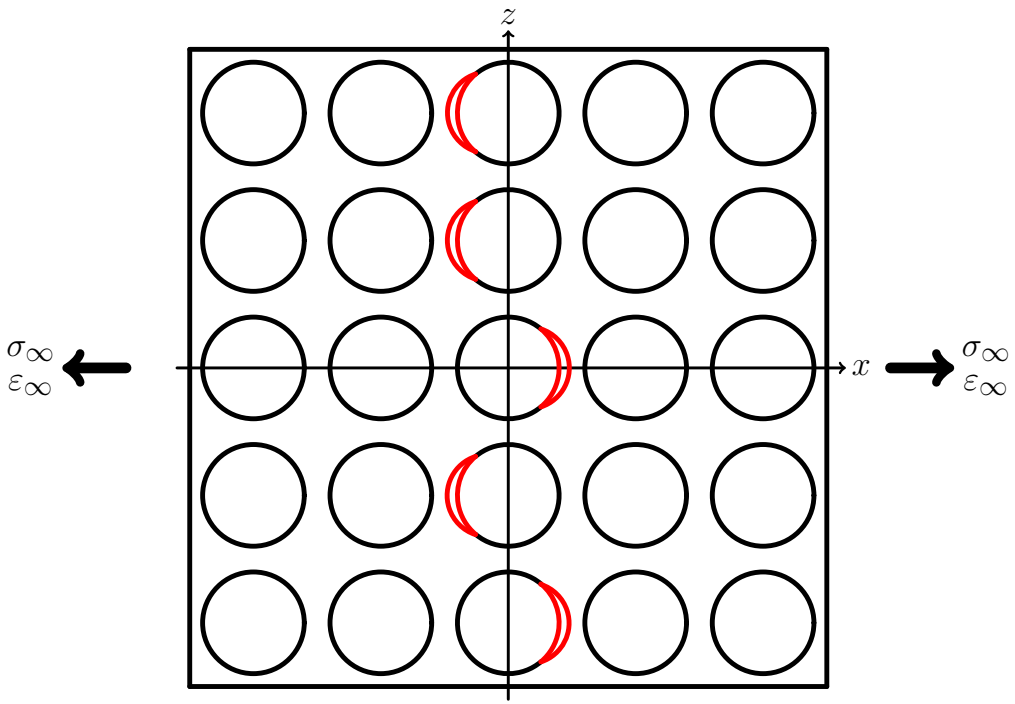
Stage 1: isolated debonds



Zhang, H., Ericson, M. L., Varna, J., Berglund, L.A.; 1997. *Transverse single-fibre test for interfacial debonding in composites: 1. Experimental observations*. *Compos. Part A-Appl. S.* **28** (4) pp. 309–315.

Initiation of Transverse Cracking in FRPCs: Micromechanics

Stage 2: consecutive debonds



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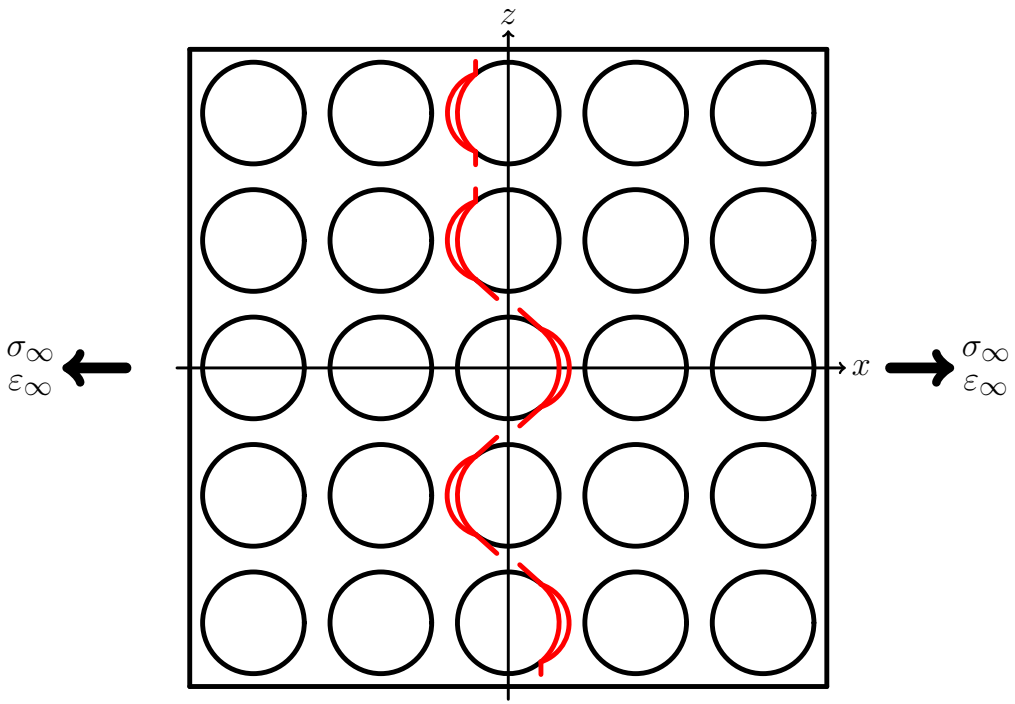
Initiation of Transverse Cracking in FRPCs: Micromechanics

Stage 3: kinking



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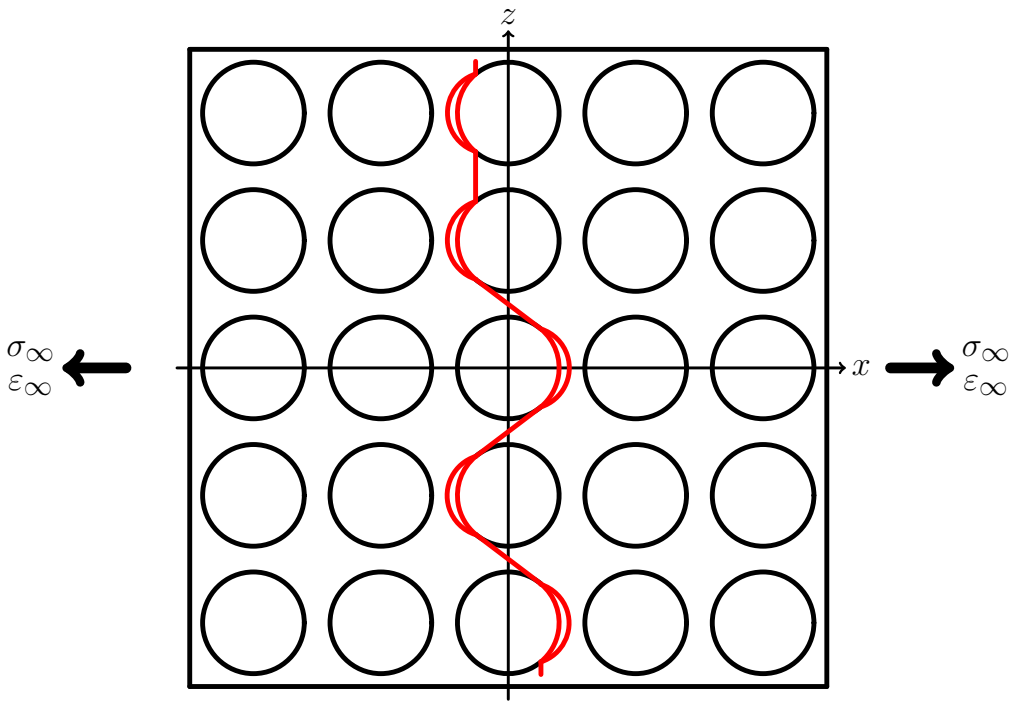
Initiation of Transverse Cracking in FRPCs: Micromechanics

Stage 4: coalescence



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↘ CONCLUSIONS

Conclusions

➔ $f_{\text{straight crack}}(\Delta\theta)$: ✓ G_I, ✗ G_{II}

$f_{\text{inclined crack}}(\Delta\theta)$: ✓ G_I, ✓ G_{II}, ✗ $\nexists\ f_{\text{inclined crack}}\left(\Delta\theta = \frac{\pi}{2}\right)$

$f_{\text{curved crack}}(\Delta\theta)$: ✓ G_I, ✓ G_{II}

➔ scaling breaks for $\Delta\theta \leq 20° \rightarrow$ microstructure is important for small debonds!


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