

Bonding Polymer composites with PEI film: crack trapping and enhanced fracture resistance

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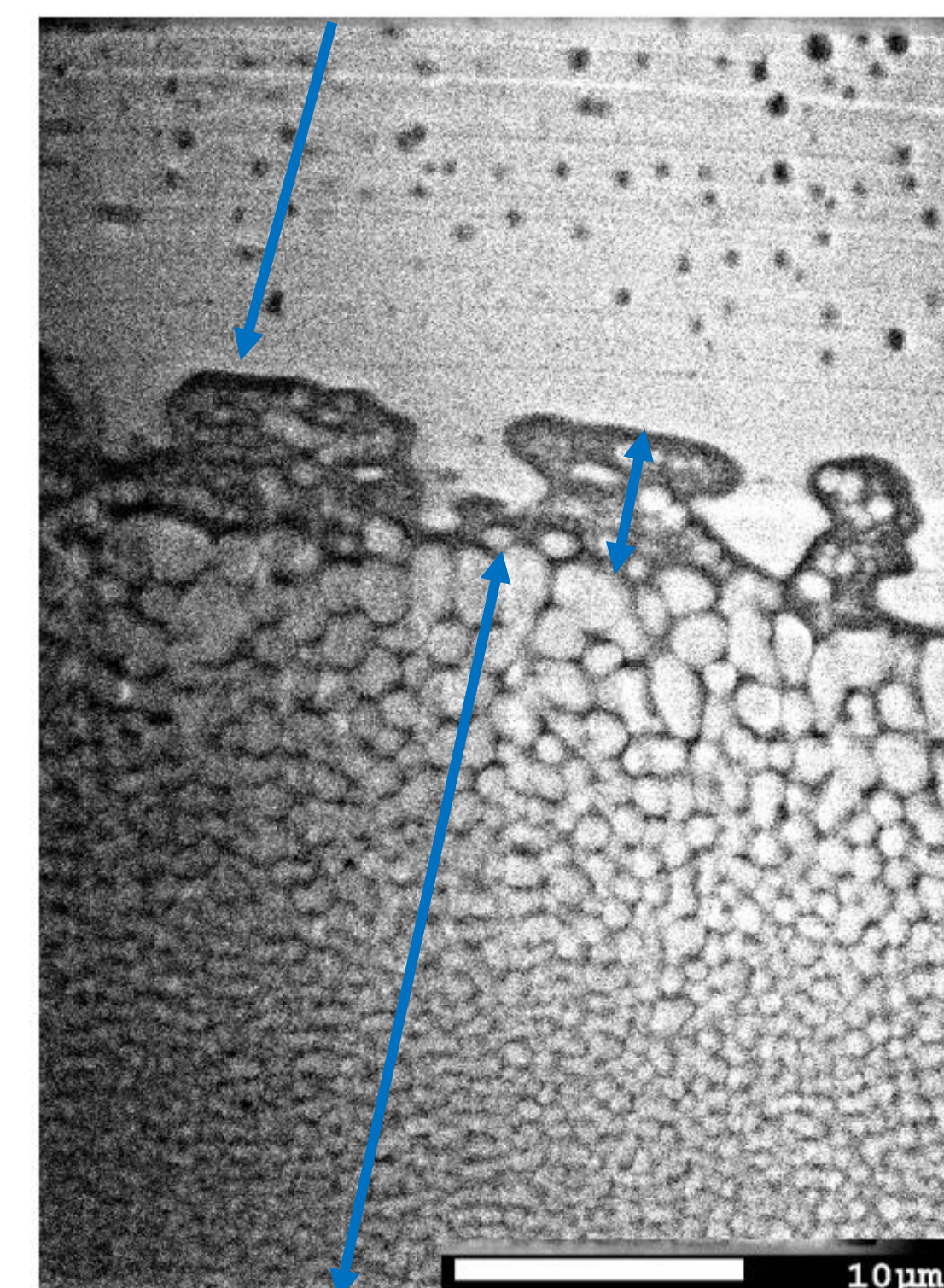
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Introduction

- Bonding composites with adhesives
 - Low to moderate toughness
 - Lack of integrated manufacturing
- ⇒ One solution: bonding through a thermoplastic layer

- Voleppe et al. [1]: PEI film in RTM6
 - High G_{IC} ~880 J/m²
 - Crack trapping in interphase

Question : Is it possible to trap the crack and increase fracture toughness when assembling composites with a PEI film?



RTM6- rich zone

Transition zone

PEI-rich zone

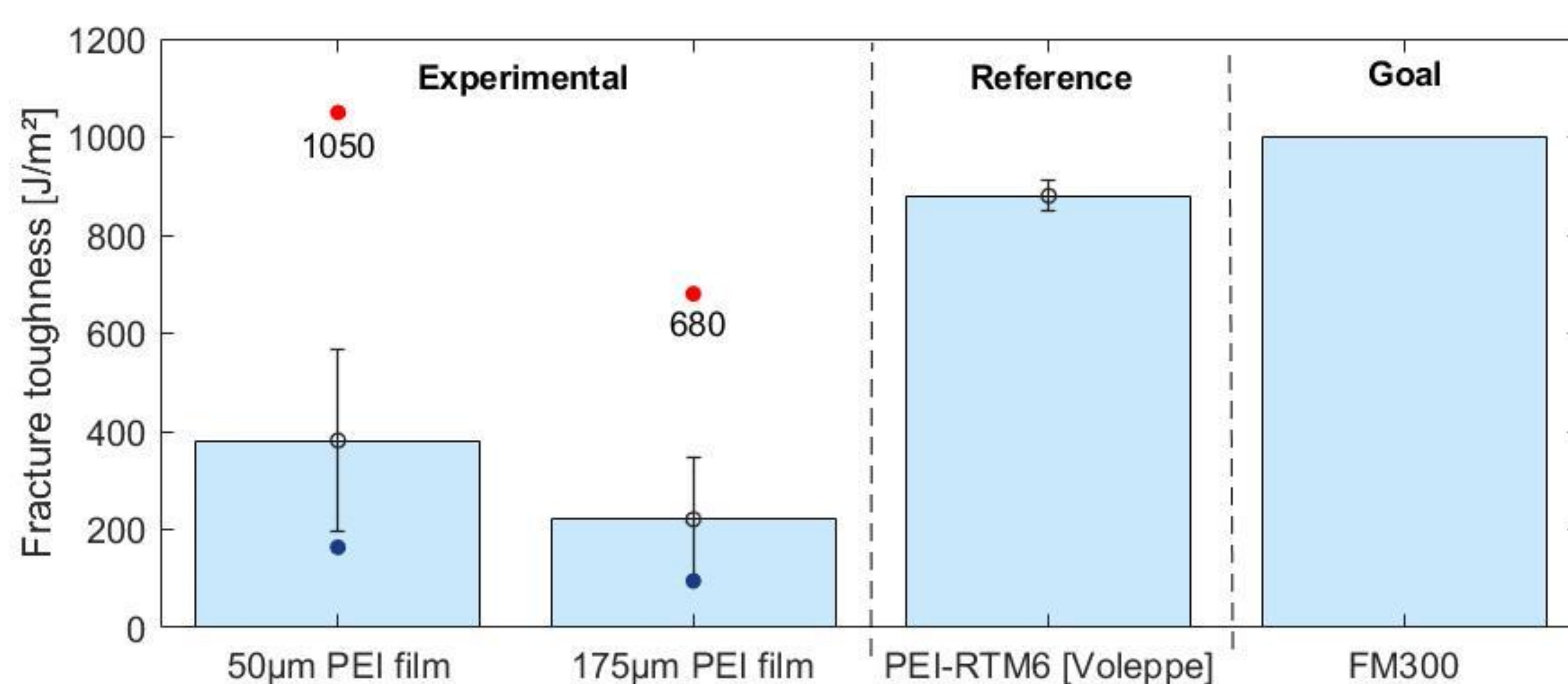
Crack trapping

Figure 1: morphological gradient at the PEI-RTM6 interface with the crack trapping zone

Results and discussions

DCBs on composites

In average, low fracture toughness was found except for few promising values attaining 1000 J/m²: concept potentially works

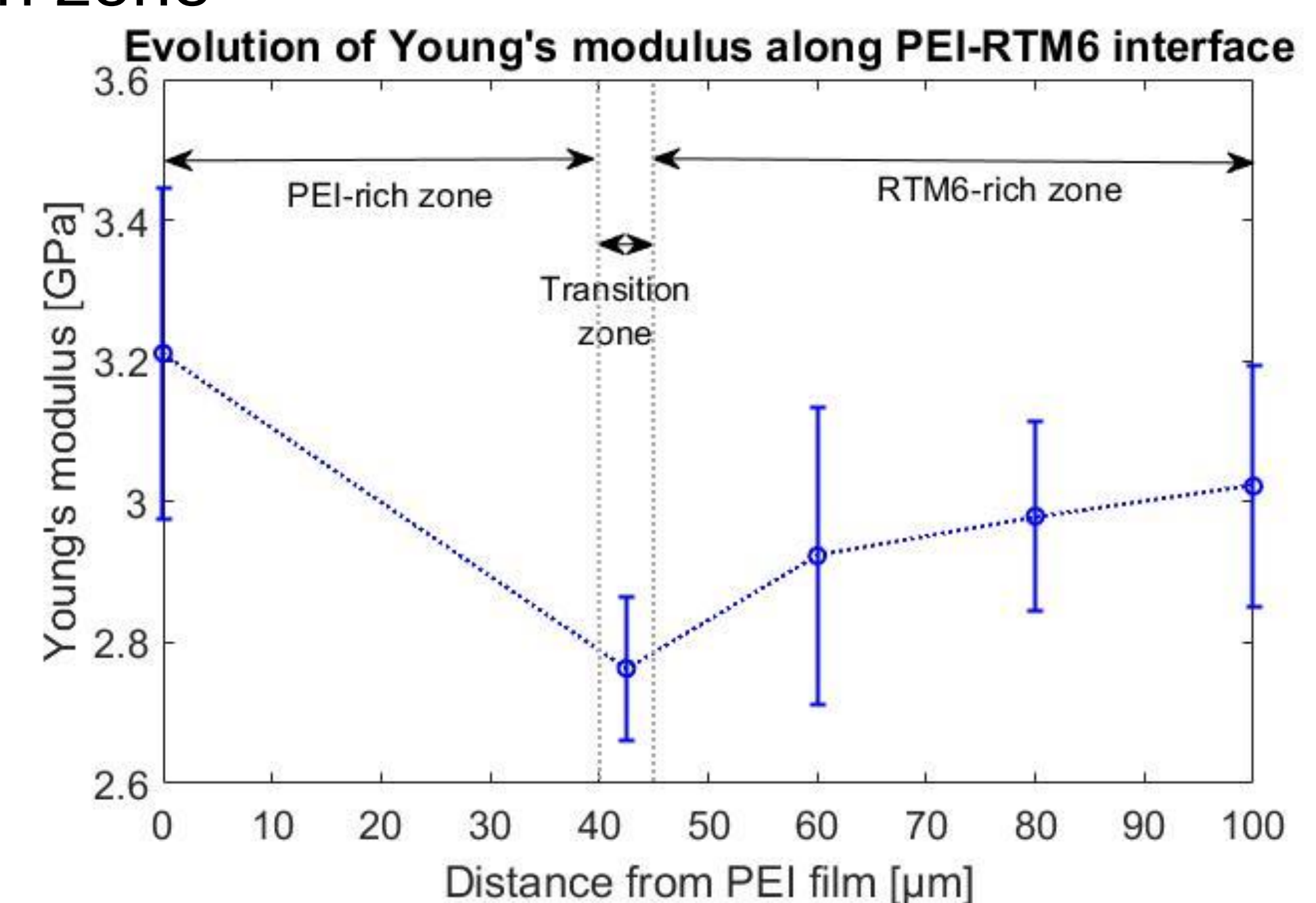


Main problem: fibres too close from the PEI film preventing the formation of the interphase for crack trapping

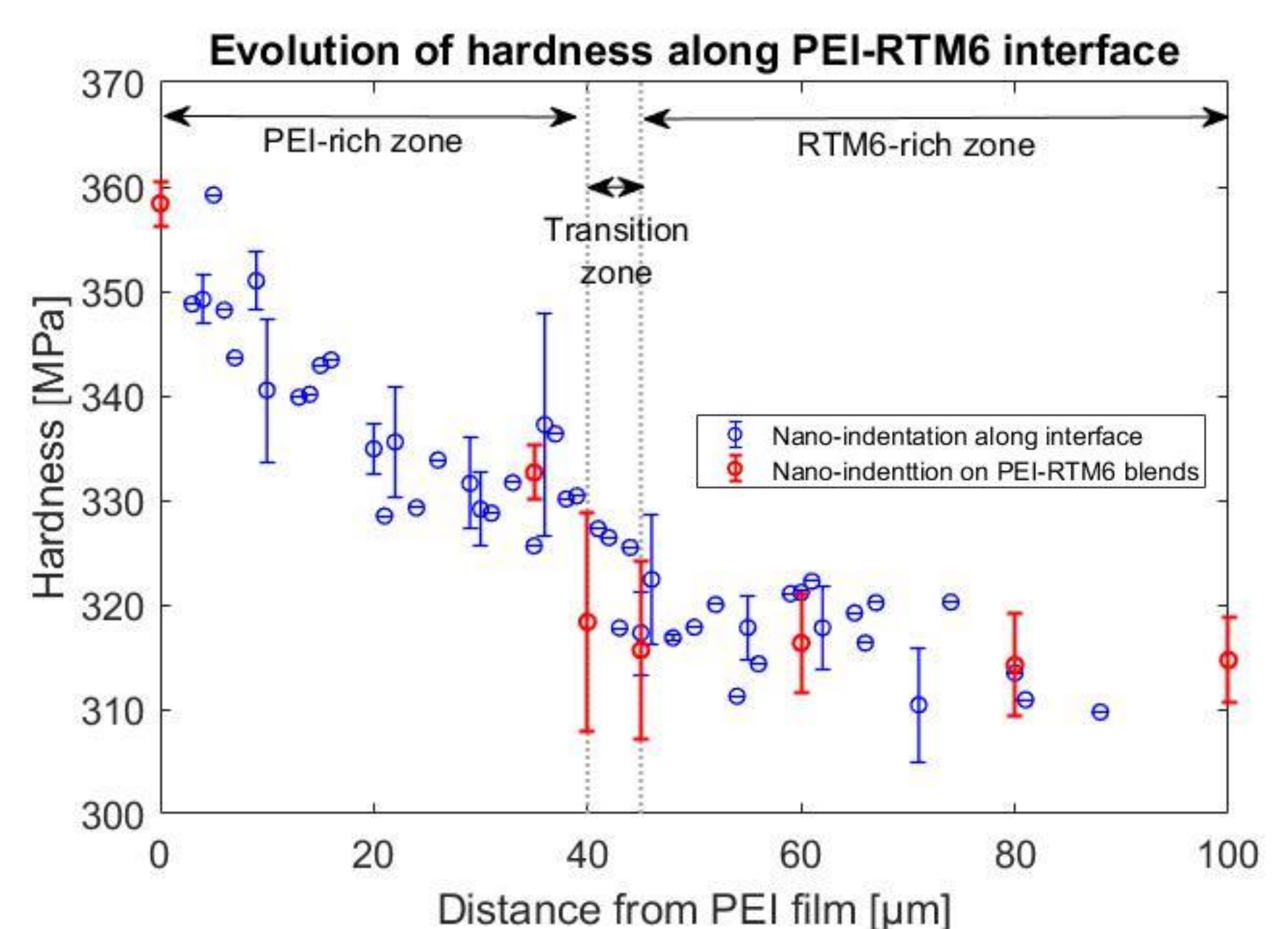


Interface mechanical properties

Compression Young's modulus: slight decrease in the transition zone



Hardness: decrease across the interface



Conclusion

Promising results, but some polymer matrix layer must be present in between the carbon fibres and the PEI film

Perspectives

- Create a separation layer between the fibres and the film
- Determine fracture toughness of PEI-RTM6 blends
- FE simulations to understand the crack trapping mechanism