The Behaviour of Uncured Prepreg

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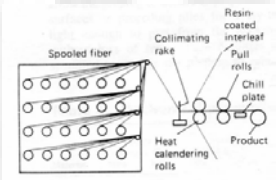
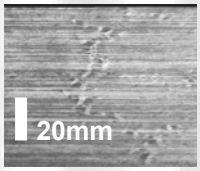
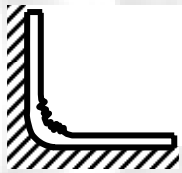
Target Areas of Interest

- Non-uniformities in fibre length and distribution affect pre- and post-cure processes.
- Defects can be introduced during prepreg and component manufacture.

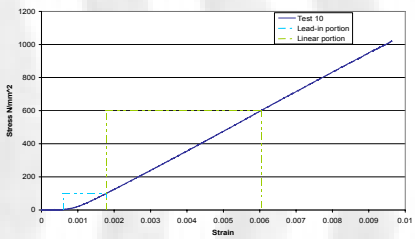






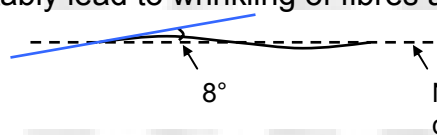
Inherent Defects

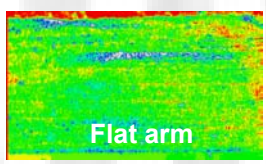
- If strips of uncured UD prepreg are held under tension for any period of time up to 1 hour, the tows contract along the width and separate.
- The prepreg samples failed one tow at a time.
- This behaviour indicates fibres of different lengths within tows as well as different tow lengths within the prepreg.
- Stress-strain curves show a considerable region of non-linearity up to about 0.15% strain.
- A 10% reduction in modulus for uncured samples could not be fully recovered by cure.

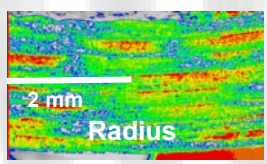


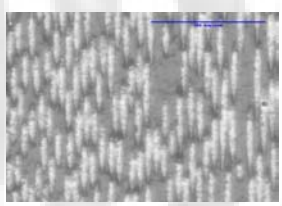
Processing Defects

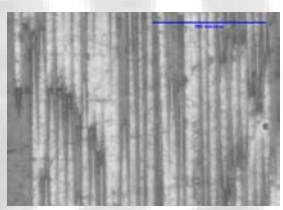
- Lay-up of prepreg around a radius will inevitably lead to wrinkling of fibres at the inner radius.
- Bending a 0.25 mm thick layer of prepreg around a 20 mm radius will result in an 8° level of fibre wrinkling.
- This level of wrinkling can be detected by taking a section at the given angle and looking at point-to-point differences in brightness levels. The false colour images show green as the undisturbed grey area with blue as light and red as dark patches.
- By measuring the angles of a selection of fibres in a ply, a more detailed picture of the variation of fibre misalignment can be achieved.











Conclusions

- The characteristics of uncured prepreg, in particular fibre wrinkling, have a significant effect on the finished composite component.
- In order to produce reliable, high-performance, high-quality parts, the properties and behaviour of the uncured material need to be understood.