

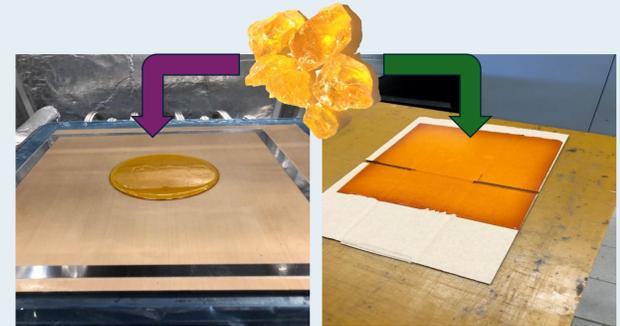
Debonding-on-demand enabled by vitrimer adhesives

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Introduction

- Bisphenol-A-benzoxazines (BA-a) present low volume change, low water absorption and high T_g
- Amine additivation improves mechanical and processing properties, whilst yielding de- and re-bondable adhesive joints with vitrimer behaviour
- Challenge:** determine optimal BA-a:amine ratio and curing conditions



Paste system

Film system

Methodology

- Materials → BA-a (Araldite MT 35600), Amine (Jeffamine ED-600), Aluminium (EN AW 7075)
- Adhesive system → Paste and film
- BA-a:amine ratios → 1:0.5 and 1:0.25
- Surface preparation → laser pre-treatment
- Curing (°C/h) → C1:120/6, C2:120/2+150/4, C3:120/2+150/4+180/2
- Thermal characterisation → DMA, TGA
- Lap-shear testing (DIN EN 1465) → Bonding, De-Bonding, Re-Bonding

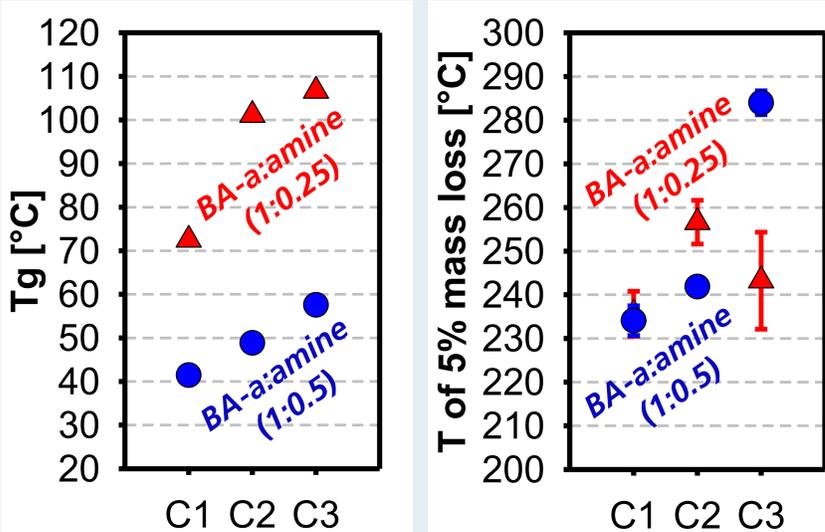


Lap-shear test

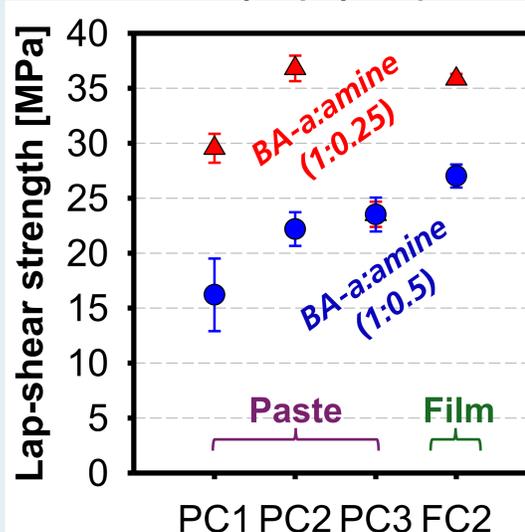
Laser pre-treatment

Results

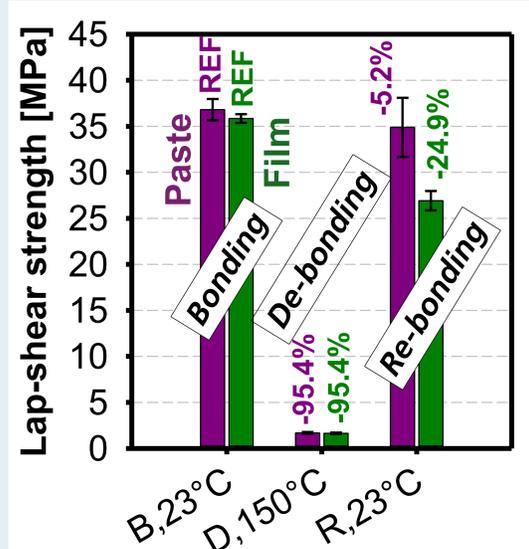
Thermal characterisation



Lap-shear testing



De-bonding / Re-bonding



Conclusions

- Optimal BA-a:amine ratio → 1:0.25, Optimal curing → C2 (120°C/2h + 150°C/4h)
- De-bonding with no substrate damage → 95.4% reduction of separation force
- Re-bonding with no extra adhesive application → 94.8% (paste) and 75.1% (film) recovery of original strength

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