

ACCELERATED ADHESION PROCESSES FOR GLASS FIBER EPOXY COMPOSITE MATERIALS



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PURPOSE

- ◆ Adhesion processes for glass fiber epoxy composite materials already exist.
- ◆ Accelerated adhesion process to reduced from 7 day cure to a few minutes without an oven needed to be researched.
- ◆ Accelerated adhesion process must not reduce the adhesive properties of the material chosen
- ◆ Magnobond (adhesive chosen) may be used in a full manufacturing environment along with on-base repair
- ◆ Down time for vehicles needing repair can be significantly reduced by accelerating the cure cycle of the adhesive
- ◆ Must follow NAVAIR repair procedure manual for surface preparation

ADHESIVE, SUBSTRATES, ACCELERATION TECHNIQUE, AND TESTS

- ◆ Magnobond™ is a two part epoxy adhesive
 - ◇ Room temperature shelf life
 - ◇ 7 day room temperature cure
 - ◇ 150°F - 250 °F for 1 hour elevated temperature cure
- ◆ Glass-Epoxy substrate chosen for testing
- ◆ PTIR™ treatment with P-Wave™ accelerated curing will be the main acceleration technique
- ◆ Test to be conducted
 - ◇ Floating Roller Peel Test (ASTM D 3167-03a)
 - ◇ Lap Shear Test (ASTM D 5868)

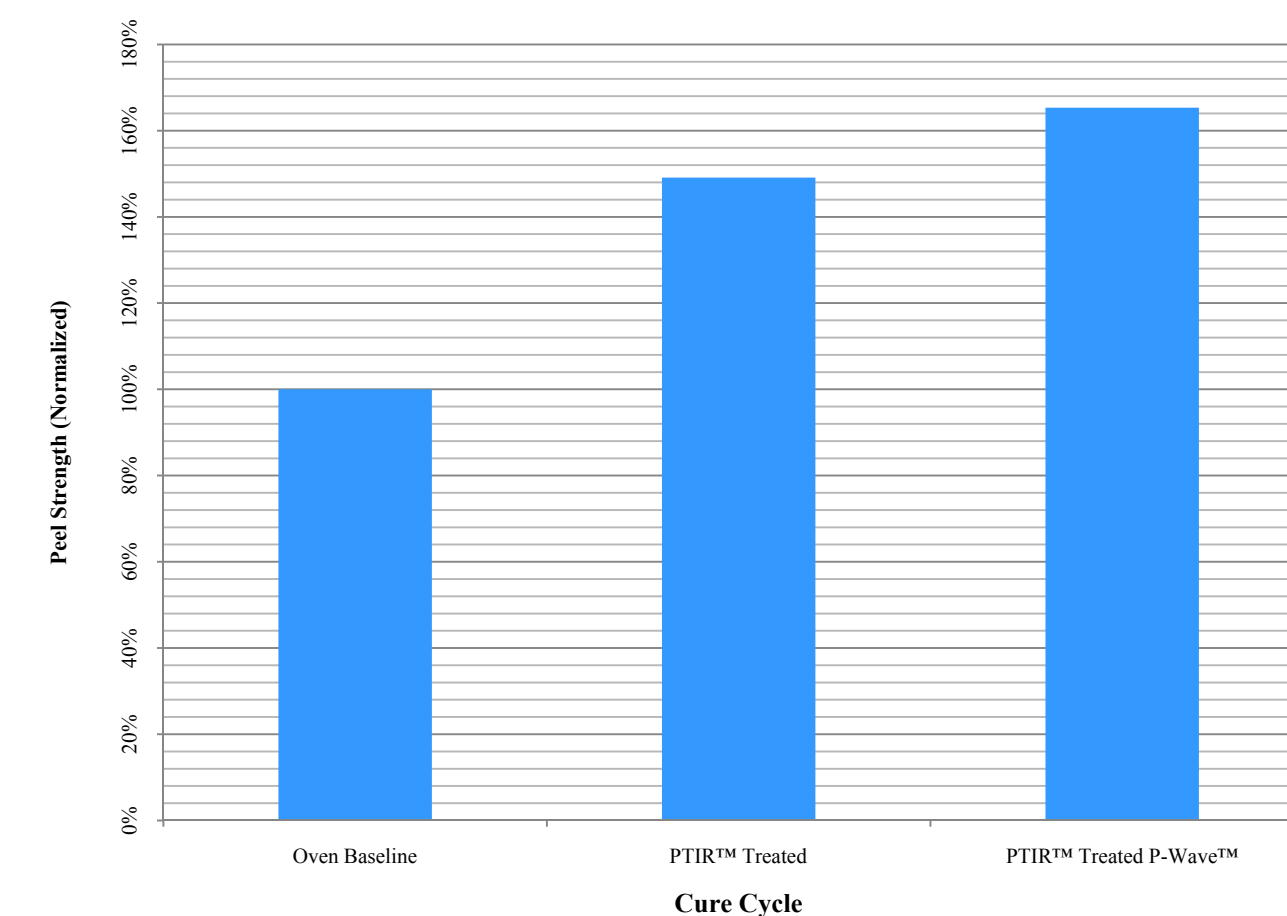
P-WAVE™ AND PTIR™

- ◆ P-Wave™ is a system developed by Kubota Research Associates Inc.
 - ◇ Emits high intensity near-infrared (NIR) radiation.
 - ◇ Radiation energy penetrates most polymeric materials allowing for maximum absorption of radiation to parts with PTIR™ even when sandwiched between parts.
- ◆ PTIR™ is a treatment method developed by Kubota Research Associates Inc.
 - ◇ PTIR™ treated resin allows for high absorption of the NIR radiation emitted by the P-Wave™
 - ◇ PTIR™ method can potentially heat >10 times faster than conventional heating methods

SAMPLE PROCESSING AND VARIABLES

- ◆ Substrates made in the hot press under specified temperature and pressure
- ◆ Adhesives cured under vacuum
 - ◇ 7 day Room Temperature
 - ◇ 150°F - 250 °F for 1 hour elevated temperature cure
- ◆ Variables include the following
 - ◇ PTIR™ treatment for additive affects
 - ◇ P-Wave™ for cure cycle

AFFECTS OF ADDITIVE AND PROCESSES DATA



CONCLUSIONS

- ◆ PTIR™ treatment and it's additive does not decrease the peel strength of the adhesive
- ◆ Increase performance due to the PTIR™ treatment mechanism is unknown
- ◆ Minor processing procedure must be changed to adapt for P-Wave™ curing
- ◆ Further understand if this procedure meets specifications, lap shear

FUTURE WORKS

- ◆ A 7 day cure sample is currently being made and should be tested
- ◆ Lap shear test for all samples must be conducted

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