046-4101 and 046-4103
Reactive Tackifiers for Use with Epoxy Resins

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Description

NuTack® E are polymeric based tackifiers designed for use in RTM, VARTM or vacuum bagging processes. NuTack® E products provide enhanced positioning of coring materials and dry glass fiber or carbon fiber roll goods. NuTack® E products are based on a reactive, toughened polymer technology specifically designed for use with epoxy resins.

NuTack® E products are available in neutral for color sensitive applications. The NuTack® E products are available for pressure pot spray or in conveniently packaged aerosol cans. Specific NuTack® E products are as follows:

Product Code	Color	Application Method
NuTack® E 046-4101	Neutral	Pressure Pot Sprayable
NuTack® E 046-4103	Neutral	Aerosol Spray

Features and Benefits

- Excellent adhesion to reinforcing glass fiber and carbon fiber roll goods as well as coring products
- Maintains interlaminar strength between plies in the finished part
- Maintains the cure and flow properties of epoxy infusion resins
- Reactive chemistry allows for a broad application window
- Available with blue dye for visual thickness control or neutral for color sensitive applications
- Available in convenient aerosol packaging or in 5-gallon and 55-gallon quantities for pressure pot spray in high volume applications.

Application

1. Before use:

   Pressure Pot Spray

   Mix prior to use. Use NuTack® E as supplied out of the container. DO NOT add any solvent, resins or peroxides.

   Aerosol Can Spray

   Use as supplied from the aerosol can. Shake the can well before each use.

2. Wear safety glasses and protective clothing. Use NuTack® E only with adequate ventilation. Always point the spray tip away from the body.
3. Protect surrounding surface areas from overspray by using paper, plastic film or cardboard.
4. Hold the aerosol can or pressure-pot spray gun about 8-10 inches from the surfaces to be tacked and spray a continuous film of NuTack® E on one or both surfaces. Use the minimum amount needed to hold the two surfaces together. Typical application thicknesses are 0.5-1.0 mils. One mil will weigh approximately 2.0-g/ft^2 while wet or 1.0-g/ft^2 after solvent evaporation. If applied at the recommended thickness:
    - One 22.5 oz aerosol can of NuTack® E 046-4103 should provide 150-300 ft^2 of coverage.
    - One gallon of NuTack® E 046-4101 or NuTack® E 046-4103 should provide 1500-3000 ft^2 of coverage.
5. Firmly press dry fiber plies or core materials into the NuTack® E tackifier.
6. Repeat steps 4 and 5 as often as needed to build proper laminate and core schedules. Re-apply more NuTack® E after several hours if tack is too low or if dry goods require re-positioning.
7. Clean up can be done with a variety of solvents and paint thinners.

Physical Properties

Mechanical properties of laminates fabricated using NuTack® E and a popular nonreactive adhesive were evaluated for physical properties and compared to laminates fabricated without using tackifier. Nonreactive, rubberized, adhesive based products have been the standard for positioning reinforcements and core during the RTM, VARTM or vacuum bagging processes. Interlaminar shear, compression and flexural testing were used to characterize adhesion between plies of an infused laminate. For both adhesion tests, NuTack® E and the nonreactive adhesive were applied per manufacturer's instructions. Test laminates were fabricated using 15 plies of 18 oz/ft^2 glass fiber woven roving. Tackifier was applied between each ply. The tackifier application thickness was limited to 1 mil. The laminates were then infused with Rhino R-1401-21 epoxy resin and H-4101-21 Fast Hardener (100 parts resin to 30 parts hardener). Test results are shown in Figures 1-4.

Figure 1. NuTack® E Interlaminar Shear Results

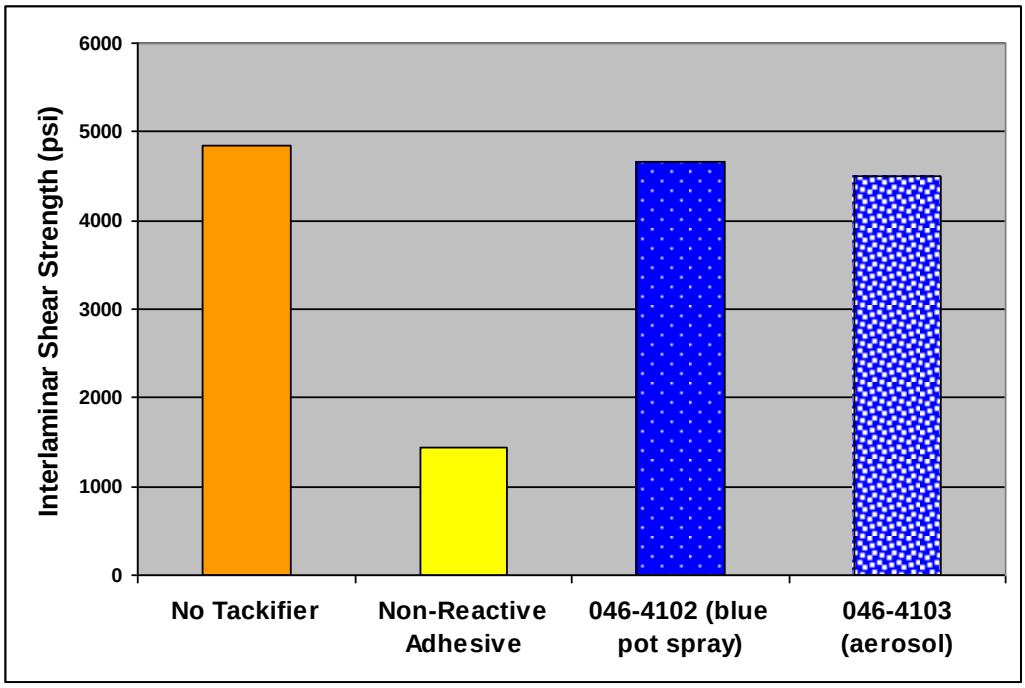


Figure 2: NuTack® E Compressive Strength Results

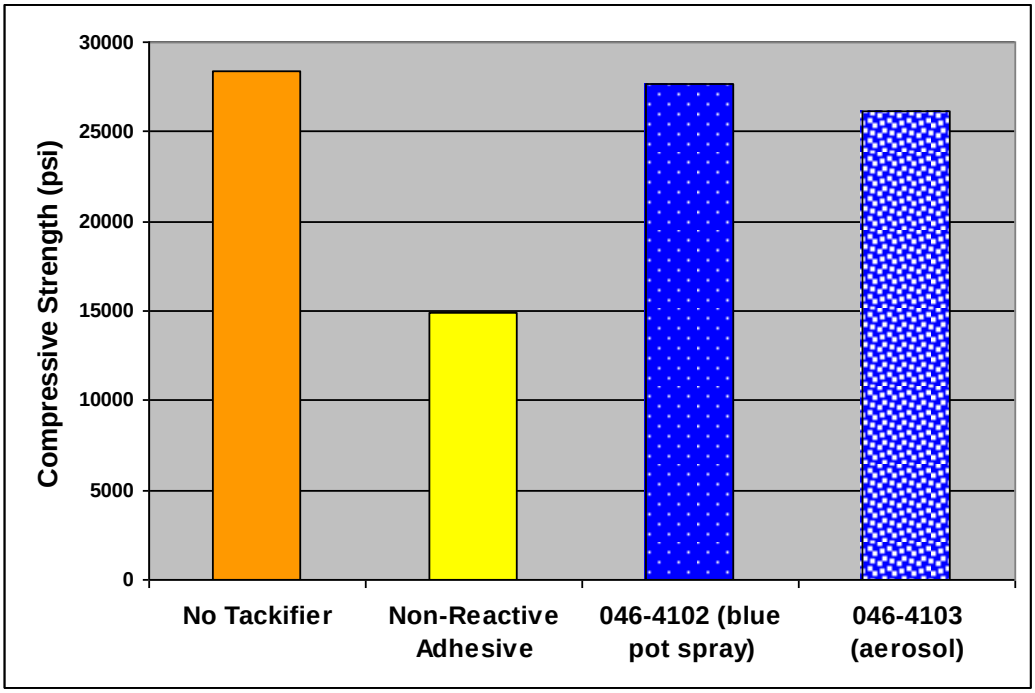


Figure 3: NuTack® E Flexure Strength Results

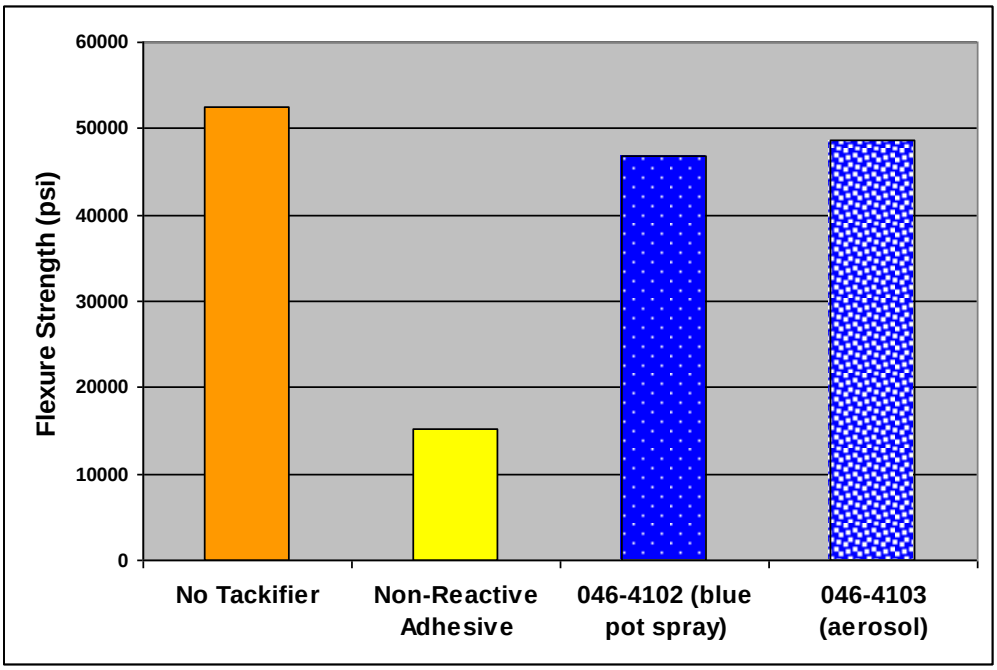
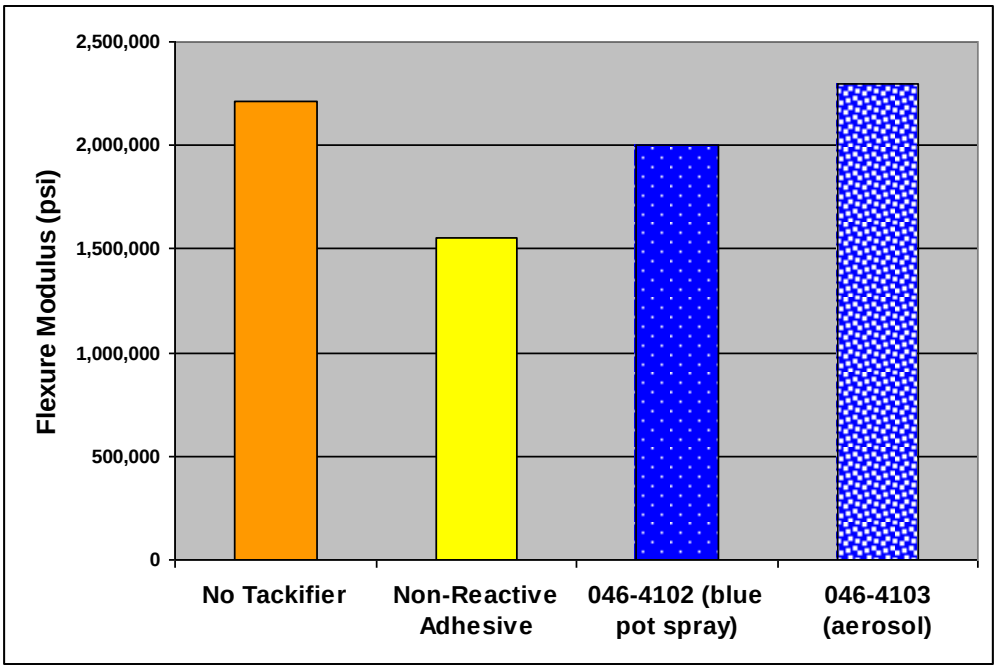


Figure 4: NuTack® E Flexure Modulus Results



Property retention of laminates fabricated with the nonreactive adhesive and NuTack® E are shown in the table below.

Property Retention *(versus No tackifier)*	**Test Method** (1)	**Nonreactive Adhesive**	**NuTack® E 046-4103 (aerosol)**
Interlaminar Shear Strength	ASTM D2344	30%	93%
Compressive Strength	ASTM D695	52%	92%
Flexure Strength	ASTM D790	29%	93%
Flexure Modulus		70%	104%

(1) Tests conducted per internal Polynt test methods similar to ASTM methods shown above.

Laminates tacked with NuTack® E had much higher physical properties than those tacked with the nonreactive tackifier. Laminates tacked with NuTack® E had very similar physical properties to laminates fabricated without tackifier. Use of the nonreactive tackifier resulted in significantly decreased physical properties.

For the testing reported above, the tackifier application was tightly controlled by weighing. However, tackifier application amounts may vary in manufacturing shops. The tackifiers themselves are regulated under application. The effect of over-application is a concern. Evaluation of the nonreactive adhesive showed that over-application interrupted the resin flow resulting in laminates with dry glass and low physical properties. Over-application of NuTack® E had much less effect on resin flow and physical properties. While over-application of NuTack® E is less problematic than with the nonreactive adhesive, Polynt recommends that NuTack® E be applied at the minimum amount needed to hold reinforcements or coring materials.

The physical properties reported above demonstrate the performance of NuTack® E. However, each manufacturer should test the product using their specific laminate designs, materials, and under their usage conditions.

Related Products

NuTack®-BLU Reactive Tackifier for Polyesters

Caution

Store NuTack® E 046-4103 aerosol cans away from heat (>120°F), sparks, flame and sources of static discharge. The cans are under aerosol pressure and could become unstable. Read all side panel safety precautions printed on the aerosol cans.

Never spray the aerosol or pressure pot can directly at your face or expose the can to an open flame or spark.

Storage Limitations

Usage life of NuTack® E 046-4101 is 6 months from the date of manufacture when stored at 73°F or below, in a closed, factory-sealed, opaque container, and out of direct sunlight.

Usage life of NuTack® E 046-4103 aerosol product is >12 months in the original container, stored at 80°F or less and out of direct sunlight.

SDS / Data Sheets

SDS and data sheets can be obtained by contacting your Polynt representative or Polynt Customer Service at 800-322-8103.

POLYNT SAFETY INFORMATION

All sales of products manufactured by Polynt and described herein, are made solely on condition that Polynt customers comply with applicable health and safety laws, regulations and orders relating to the handling of our products in the workplace. Before using, read the following information, and both the product label and Safety Data Sheet pertaining to each product.

Most products contain styrene. Styrene can cause eye, skin and respiratory tract irritation. Avoid contact with eyes, skin and clothing. Impermeable gloves, safety eyewear and protective clothing should be worn during use to avoid skin and eye contact. Wash thoroughly after use.

Styrene is a solvent and may be harmful if inhaled. Reports have associated repeated and prolonged occupational overexposure to solvents with permanent brain and nervous system damage. Extended exposure to styrene at concentrations above the recommended exposure limits may cause central nervous system depression causing dizziness, headaches or nausea and, if overexposure is continued indefinitely, loss of consciousness, liver and kidney damage.

Do not ingest or breathe vapor, spray mists or dusts caused by applying, sanding, grinding and sawing products. Wear an appropriate NIOSH/MSHA approved and properly fitted respirator during application and use of these products until vapors, mists and dusts are exhausted, unless air monitoring demonstrates vapors, mists and dusts are below applicable exposure limits. Follow respirator manufacturer's directions for respirator use.

The 12th Report on Carcinogens issued by the National Toxicology Program lists styrene as a “reasonably anticipated” carcinogen, but the Report cautions that the NTP listing does not mean that styrene presents a risk to persons in their daily lives. The Styrene Information and Research Center does not agree with the classification as it did not include a review of all available data. SIRC states: “HHS included styrene in the 12th RoC despite the fact that European Union regulators have determined styrene does not represent a human cancer concern. E.U. scientists reviewed the full styrene database, weighing all of the available data in reaching their conclusion.”

The International Agency for Research on Cancer (IARC) reclassified styrene as Group 2B, "possibly carcinogenic to humans." This revised classification was not based on new health data relating to either humans or animals, but on a change in the IARC classification system. The Styrene Information and Research Center does not agree with the reclassification and published the following statement: Recently published studies tracing 50,000 workers exposed to high occupational levels of styrene over a period of 45 years showed no association between styrene and cancer, no increase in cancer among styrene workers (as opposed to the average among all workers), and no increase in mortality related to styrene.

Styrene is classified by OSHA and the Department of Transportation as a flammable liquid. Flammable products should be kept away from heat, sparks, and flame. Lighting and other electrical systems in the workplace should be vapor-proof and protected from breakage.

Vapors from styrene may cause flash fire. Styrene vapors are heavier than air and may concentrate in the lower levels of molds and the work area. General clean air dilution or local exhaust ventilation should be provided in volume and pattern to keep vapors well below the lower explosion limit and all air contaminants (vapor, mists and dusts) below the current permissible exposure limits in the mixing, application, curing and repair areas.

Some products may contain additional hazardous ingredients. To determine the hazardous ingredients present, their applicable exposure limits and other safety information, read the Safety Data Sheet for each product (identified by product number) before using. If unavailable, these can be obtained, free of charge, from your Polynt representative or from: Polynt, 99 East Cottage Avenue, Carpentersville, IL 60110, 800-322-8103.

FIRST AID: In case of eye contact, flush immediately with plenty of water for at least 15 minutes and get medical attention; for skin, wash thoroughly with soap and water. If affected by inhalation of vapors or spray mist, remove to fresh air. If swallowed, get medical attention.

Those products have at least two components that must be mixed before use. Any mixture of components will have hazards of all components. Before opening the packages read all warning labels. Observe all precautions.

Keep containers closed when not in use. In case of spillage, absorb with inert material and dispose of in accordance with applicable regulations. Emptied containers may retain hazardous residue. Do not cut, puncture or weld on or near these containers. Follow container label warnings until containers are thoroughly cleaned or destroyed.

FOR INDUSTRIAL USE AND PROFESSIONAL APPLICATION ONLY. KEEP OUT OF REACH OF CHILDREN.

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LIMITED WARRANTY.

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