# NASA TECH BRIEF

*Marshall Space Flight Center*



## Functionally Terminated Liquid Nitroso Fluorocarbon Terpolymers

In a developmental program in which the objective was to obtain a polymeric conformal coating for electronic circuity, the requisite properties for the material included transparency, flexibility and low modulus of elasticity at 208K(−65°C), workable viscosity, adequate application life, good adhesion, and nonflammability. Nitrosofluorocarbon polymers were selected for the application because prior screening pointed out that these polymers satisfy many of the desired properties.

Acyl fluoride terminated liquid polymers were obtained by the ozonolysis of unsaturated terpolymers made from $CF_3NO$, $C_2F_4$, and $C_4F_6$. The ozonolyses were conducted in high yield using a fluorocarbon solution of ozone at elevated pressures. The unsaturated terpolymers containing backbone to pendant unsaturation in 7:1 ratio were prepared both in bulk and solvent systems with 5 and 10 mole-% hexafluorobutadiene. The liquid acyl fluoride polymers were easily converted to the corresponding carboxylic acid, ester, or amide on treatment with the requisite reagents. Reduction of the liquid, ester-terminated polymer to the alcohol was successfully achieved by means of lithium aluminum hydride. The liquid carboxy polymers were reacted with ethylene oxide to give the hydroxyethyl ester terminated materials. In similar fashion, the liquid carboxy terpolymer of $CF_3NO$, $C_2F_4$, and $ON(CF_2)_3$-COOH yielded hydroxyethyl derivatives. The ozonolysis is fast, simple, and does not introduce impurities that would be difficult to remove and would cause problems during curing. A variety of functional groups can be introduced into the polymer. The technique also allows the regulation of cross link densities, molecular weight, and viscosity. Relatively high yields are obtained in comparison to other methods.

### Notes:

1. Information concerning this innovation may be of interest to the chemical, rubber, and plastics industries.
2. Requests for further information may be directed to:
   Technology Utilization Office
   Marshall Space Flight Center
   Code A&TS-TU
   Huntsville, Alabama 35812
   Reference: B72-10493

### Patent status:

No patent action is contemplated by NASA.

Source: N. Mayes and A. Marœllis of
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