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Synthesis of Fluorinated Organic Compounds Using Oxygen Difluoride

An investigation of the oxygen difluoride (OF_2) effects on monomers, fluoropolymers, and other organic compounds has shown OF_2 to be a versatile reagent in a wide variety of reactions. Its uses include: addition reactions for the chain extension of polyperfluoropolyenes; modifications to functional groups of terminal and pendant perfluorovinyl groups in fluoropolymers; graft copolymerizations; addition copolymerizations to form perfluoroalkylene oxide polymers; and various addition reactions with fluoroolefins, forming such compounds as fluoroalkyl ethers, fluoroalkyl hypofluorites, and acyl fluorides. Chain extension reactions of OF_2 with fluoropolyenes or ether-formation reactions with perfluorodienes, versus reactions to form acyl fluoride groups, can be selectively controlled. Many new fluoropolymers, monomers, and other fluorinated organic compounds have been synthesized by reactions involving OF_2 , and several previous formulations have been closely duplicated using OF_2 synthesis, a much simpler, higher-yield procedure than that originally followed.

Carboxyl polyperfluorobutadiene, resulting from a reaction of OF_2 with polyperfluorobutadiene, is a strong adhesive suitable for use on a wide variety of surfaces, including untreated bulk polytetrafluoroethylene (PTFE). A tensile strength of 1164 kN/m² (169 psi) has been measured at 248K (-25°C) for the new adhesive between two 2.54 cm (1 in.) squares of untreated PTFE. In tensile or composite tensile shear-strength measurements using the new adhesive to bond either two pieces of PTFE or a

single PTFE layer between two aluminum sheets, the parting line due to cohesive failure was observed in the bulk of the adhesive. Parting due to adhesive failure was not seen at the adhesive-PTFE or adhesive-metal interfaces.

Notes:

1. Extreme care must be taken in working with OF_2 . Because of its high energy content and reactivity, its reactions with organic compounds present a severe explosion hazard.
2. Requests for further information may be directed to:

Technology Utilization Officer
NASA Pasadena Office
4800 Oak Grove Drive
Pasadena, California 91103
Reference: B71-10154

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to:

Patent Counsel
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