Fluorine-Containing Polymers.
I. Fluorinated Vinyl Polymers with Functional Groups, Condensation Polymers, and Styrene Polymers

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I. Introduction

Polytetrafluoroethylene (Teflon) and polychlorotrifluoroethylene (Kel-F) served for many applications during World War II, when urgent requirements for thermally stable, solvent resistant polymeric materials were uppermost. During the years following the war, a great deal of research and engineering effort was expended in the synthesis of various fluorine-containing monomers and subsequent polymerization into materials which would function in a variety of applications under conditions of high temperature and in the present of organic solvents, fuels and oils. Teflon and Kel-F are now materials of considerable commercial importance. More recent developments such as a new fluorocarbon elastomer, "Viton A" (E. I. du Pont de Nemours) and a new fluorine-containing silicone elastomer, "Silastic LS-53" (Dow Corning Corp.) also indicate great commercial utility.

It is the purpose of this paper to review the progress in the field of fluorine-containing polymers, excepting those derived from fluorocarbon olefins and dienes. Previously, very little information has been compiled on the subject of fluorine-containing vinyl polymers with functional groups, condensation polymers and homo-and copolymers of styrenes.

Monomer synthesis and polymerization data are presented for several classes of materials. Tables of monomers are listed with some physical properties, and physical, chemical and mechanical properties of polymers are indicated, wherever possible.

II. Vinyl Polymers with Functional Groups

A. Acrylic Esters

A considerable amount of work has been done on the fluorine-containing acrylates. For purposes of a systematic review it may be conveniently divided into two general areas; acrylates in which the fluorine is contained on the acid moiety of the ester, and the acrylates derived from fluorohalohols. The latter group has received a more detailed and systematic study and will be discussed later in this section.