

4. Carbon

Graphite produced from diamonds at 40,000 atm. and 2,000°C contains some rhombohedral graphite. Only the hexagonal form has been found at room temperature; thus, rhombohedral graphite may be an *intermediary* in diamond formation.⁴

5. Carbon Disulfide

Polymer has been obtained at 15,000 atm., 20°C, and γ dose rate of 18Mr/hr.⁶ Gradual increase in G-value for conversion of monomer to polymer noted with increasing temperature and pressure. Most samples are intensely black solids which swell in but are not dissolved by the monomer. Extraction with hot pyridine resulted in a residue (75%) which is *more stable thermally* than the unextracted material.⁸

6. Phosphorus

- Black phosphorus has been prepared at 16,000 and 25,000 atm. and 800°C.⁴

III. ORGANIC REACTIONS AND MATERIALS

1. 1,2,3,4,5-Pentafluorophenyl 1,2,3-Trifluorovinyl Ether

A yield of 2.7% of polymer has been obtained at 105°C and 12,000 atm., under γ -irradiation.³

2. n-Perfluoroheptene-1

Pressures of 11,000-15,000 atm. accelerate rate of polymerization by a factor of 30 over rate at 1 atm., under γ -irradiation. G-value for conversion of monomer to polymer *increases* with temperature at approximately constant pressure, and with pressure at constant temperature, with expectation of maximum between 200-300° at 12,000 atm. Polymer appears to have a high glass transition and is probably transparent in the ultraviolet.⁸

3. Perfluorocyclobutene

Polymerizes slowly with low yield at 25,000 atm. and 250°C, but not at 40,000 atm. and 200°C. Good yield results in use of hexafluoroacetone as solvent.⁴

4. Perfluoropropylene

Homopolymerized at temperatures of 200-300°C between 10,000 and 40,000 atm. using free radical catalysts; polymers melt between 250-315°C. In this pressure range there is *no effect on yield*.⁴

5. Propylene

Polymerization under pressure to 15,000 atm. and temperature to 83°C initiated by γ radiation proceeds by a *chain mechanism*. A free radical rather than an ionic mechanism is indicated. Propylene becomes more *difficult to compress* with increasing pressure and decreasing temperature; average intermolecular distance at 15,000 atm. is still considerably greater than normal bond lengths. Maximum conversion of monomer to polymer was 20%.²