

A<sub>9</sub>

## THE FLUORINATION OF PLASTICS IN SOLVENTS WITH ELEMENTARY FLUORINE

Claus Bliefert\*, Hans-Michael Boldhaus, Frank Erdt and Manfred Hoffmann

Labor Fluorchemie, Fachbereich Chemieingenieurwesen, Fachhochschule Münster, Stegerwaldstr. 39, 4430 Steinfurt (F.R.G.)

A procedure [1] is described which permits the fluorination of surfaces of plastic materials, especially polyethylene or polypropylene, with elementary fluorine dissolved in appropriate solvents (e.g., fluorotrichloromethane, F 11; 1,1,2- trifluorotrichloroethane, F 113) or solvent mixtures.

Certain properties of plastics such as permeability or wettability are changed by this procedure [2, 3]. The results depend on the treatment parameters

- fluorine concentration,
- solvent,
- temperature,
- treatment time,
- additives.

Results are presented for the fluorination of 1 L polyethylene bottles treated at 20 °C in 1,1,2- trifluorotrichloroethane at fluorine concentrations near 1 mmol/L for periods of 1, 3 and 10 min. At this temperature, conditions have been established which permit the reduction of the permeability of polyethylene to hydrocarbons (e.g., gasoline) to less than 2% of the permeability of non-treated material. At higher temperatures the fluorine incorporation in the treated layers increases drastically.

This method also produces a dramatic increase in adhesion of printing ink to polyethylene and polypropylene.

An apparatus for the fluorination of 1 L polyethylene bottles and a pilot plant for the treatment of 120 L polyethylene containers are described.

1 Patent DE 3 535 602 (1985) Hewing.

2 C. Bliefert, M. Boldhaus, F. Erdt and M. Hoffmann, *Kunststoffe* 76, 235 - 240 (1986); *Kunststoffe German Plastics* 76, 13 - 16 (1986).

3 C. Bliefert, 'Lösungsfluorierung (off-line)', in: VDI (Ed.) *Sperrschichtbildung bei Kunststoff-Hohlkörpern*. Düsseldorf: VDI-Verlag, 1986, pp 131 - 142.