

## **STYRENES (PS, SAN AND ABS)**

**Physical and mechanical properties:** The vitreous transition temperature of uncrystallized PS is from 90 to 100°C. The mechanical properties vary little from the low temperatures (-40°C) up to 70°C approximately, or 20°C below the vitreous transition. Within this temperature range, PS is hard, brittle, fragile and rigid. Shock resistance of ABS is improved within the - 40, + 20° C range.

**Chemical properties:** Polystyrenes have good resistance to diluted acids, aqueous salt solutions and bases. Highly-oxidizing acids attack it (nitric acid). PS dissolves and swells in numerous organic environments. SAN and ABS have good resistance to hydrocarbons, oils, greases (interesting for mechanical uses). Standard PSs can be suitable for making objects meeting regulations for foodstuffs and objects coming into contact with food. The suitability for contact with food is conditioned by the additives or coloring agents used. ABSs are recognized as being fit for use with food for making useful objects as long as this does not involve food wrapping.

**Electrical properties:** PSs are unpolarized polymers and thus characterized by excellent insulating properties within a wide range of frequencies (50 to 106 Hz). Their high specific resistance makes PSs highly electrostatic. The small dielectric losses prohibit high-frequency welding.

**Thermal properties:** PSs, containing only carbon and hydrogen, are combustible. The decomposition temperature of PS is from 280 to 320°C. When it burns, PS produces dense, black smoke and flows in the form of droplets.

**Dimensional properties:** Styrenes show excellent dimensional stability as they absorb very little water. PS (uncrystallized polymer) shows only a small retraction when molded (0.4 to 0.7%).

### **Printing and marking properties:**

Metallization using a vacuum-system: Vaporization then condensation of a metal on a part made of PS produces metallization for functional (mirror, projector...) or decorative purposes. Aluminum, copper, silver and gold are used and the surface thus metallized is protected by a varnish.

Electroplating: Metallization by electroplating is developing.

**Implementation properties:** Styrenes are easily implemented by all the methods currently applicable to compact thermoplastics, before injection and to avoid any condensation that might exist on the grains.

Products attacking styrenes: acetone, high-grade alcohol, benzene, chloroform, methylene chloride, dimethyl formamide, gasoline (regular and super), essential oils, tetrachloroethylene, carbon tetrachloride, toluene, trichloroethylene

Products that are inactive when in contact with styrenes: acetic acid, citric acid, ethyl alcohol, coffee, diethylene glycol, sea water

Joining processes:

Screwing together: PS cladding can be easily mounted by means of tapping screws.

Clipping together: For these very elastic materials under little strain, a clipping system is an elegant, simple and low-cost mounting solution.

Welding: The two most-used processes are ultrasonic welding and friction welding. High-frequency welding is not applicable as the dielectric losses are insufficient.

*Summary by GAGGIONE SAS*

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