STYRENIC (PS, SAN AND ABS)

Physical and mechanical properties:

Glass transition temperature of amorphous PS (polystyrene) is between 90 and 100 °C. Mechanical properties are stable from low temperature (-40 °C) to around 70 °C (so 20 °C under glass transition temperature). Into this temperature range, PS is hard, brittle, fragile and rigid. ABS (acrylonitrile butadiene styrene) shock resistance is enhanced in the -40 °C / +20 °C range.

Chemical properties:

Polystyrenes have a good resistance to diluted acids (except for highly oxidants, as nitric acid), salt solutions and bases. PS dilutes and inflates in some organic environments. SAN (styrene-acrylonitrile resin) and ABS resist well to hydrocarbons, oils, grease (interesting for mechanics applications). Standard PS can match the policy of the food contact materials list of the food safety. This compatibility is then conditioned by the input additives (adjuvants or dies). ABS are validated to be used in food object manufacturing (as long as is it not for packaging).

Aggressive products: acetone, benzene, chloroform, methylene chloride, dimethyl formamide, gasoline, essential oil, tetrachloroethylene, carbon tetrachloride, toluene, trichloroethylene.

Neutral products: acetic acid, citric acid, ethylic acid, coffee, diethylene glycol, sea water.

Electrical properties:

PS is chemically made of non-polar polymers, so they are characterized by excellent insulating properties in a wide range of frequencies (50 to 10^6 Hz). Its high volumetric resistivity makes the PS grades very electrostatic materials. The few dielectric losses make it non suitable for high frequency welding.

Thermal properties:

PS that contains only carbon and oxygen atoms are combustible. PS decomposing temperature range from 280 to 320 °C. During its combustion, PS products black and dense smoke and flows as droplets.

Dimensional properties:

Styrenics present an excellent dimensional stability due to its low moisture absorption. The amorphous PS features a small molding shrinkage (0.4 to 0.7%).

Printing and marking properties:

Vacuum metallization – vaporization and condensation of a metal on a PS part allow a metallization for functional (mirror, projector) or decorative purpose. Aluminum, copper, silver or gold can be used, and the metallized surface is then protected. Electroplating – metallization by electroplating is also possible.

Implementation properties:

Styrenics can easily be implemented by methods used also for compact thermoplastics. Before injection molding, a drying process is applied to avoid any condensation on the raw material.

Screwing: mounting of PS parts can be easily done with auto-threading screws.

Clipping: PS is quite elastic under weak deformation, therefore clipping is can be an aesthetic, simple and cheap solution.

Welding: Most used processes are ultrasound and friction welding. As already seen, high frequency welding is not suitable.