

# The Automation of Etching Process



**GUARNIFLON<sup>®</sup>**

PTFE Products

## NEW ETCHING TECHNOLOGY

The etching process consists in a chemical surface treatment on virgin or filled PTFE products. It allows PTFE to be glued, by means of special adhesive, on to surfaces of various materials, such as rubber, metal, plastics, etc. The new etching process of GUARNIFLON is capable of providing uniformly reactive surfaces by continuous control of solution concentration and contact time with PTFE.

### KEY PROPERTIES

- Uniform etching
- Safe and non-polluting process
- Clean and contamination-free etched surfaces
- Unique etching capabilities on:
  - thin film
  - irregular surfaces
- Treatment on one side or both sides
- Wide range of products in Virgin and Filled PTFE
  - Sheets
  - Skived tapes
  - Tubes
  - Rods
  - Machined parts

## PRODUCT DESCRIPTION

The etching process of GUARNIFLON allows to act either on finished or semifinished products.

### SHEETS AND SKIVED TAPES

Sheets and skived tapes, etched on one side or both sides, are available in the following standard sizes:

#### SHEETS

- Thickness (mm): min. 2 - max. 100
- Size (mm):
  - 600 x 600
  - 1000 x 1000
  - 1200 x 1200
  - 1500 x 1500

#### SKIVED TAPES

- Thickness (mm): min. 0.020 - max. 4
- Width (mm): min. 300 - max. 1500

Other sizes are available on request.

### FINISHED PRODUCTS

Rings, bushes, parts and other designed products can be etched either in small or in large quantities, at low cost and with uniform quality. According to the end use, etching can be carried out partially or on the total surface of the finished product.

## INSTRUCTIONS FOR USE

It is necessary to remove grease or other contaminants from the etched surface to obtain the best results. The use of ALCOHOLS or ACETONE is recommended to clean the polymer surface. Afterward make sure the solvent is removed.

### WARNING ! DO NOT USE CHLORINATED SOLVENTS

Etched PTFE can be bonded to different substrates such as metal, rubber, plastics and glass, by using standard adhesives. The choice of an adhesive depends on the nature of the material to be bonded to PTFE, the characteristics of the needed bond and operating conditions of the finished product (temperature, chemical agents, etc.). Guarniflon's experience is made available to offer detailed information about every specific request, to suggest and supply the most suitable adhesive.

### STORAGE CONDITIONS

Temperature, humidity and U.V. light have a negative effect on the etched surface. It is advisable to store the etched material in a warehouse at room temperature and low humidity, to protect it from light, direct sunlight in particular. If stored according to the conditions above, etched products can remain unchanged for a long time. Our experience suggests 10-12 months at most.

## QUALITY OF ETCHING

GUARNIFLON can guarantee the quality of etching by the control of process parameters and by evaluating the extent of etching itself through a wettability test (Contact Angle Method), and an adhesion test (ref. ASTM D903).

### CONTACT ANGLE METHOD

It is based on the measure of the angle between the tangent to a distilled water drop and the PTFE surface (ie, the contact angle).

In Figure 1 two examples of contact angle are illustrated - on unetched surface (poor wetting) and on etched surface (good wetting), respectively.

The relationship in terms of performance between contact angle and etching is shown in Figure 2.

Contact angle and surface energy of etched PTFE are related by the following formula:

$$E_s = 72 + \frac{\cos \varphi - 1}{0,025}$$

where:

$E_s$  = surface energy (dynes/cm)

$\varphi$  = contact angle (degrees)

The graph in Figure 3 shows contact angle vs. surface energy.

Fig. 1

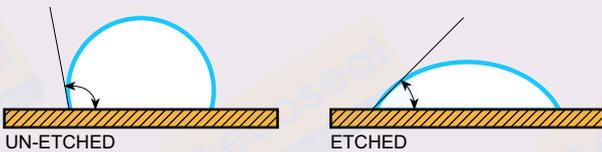


Fig. 2

Contact Angle	Degree of Etching
20° - 45°	excellent
46° - 60°	fair
>60°	poor

Fig. 3

CONTACT ANGLE vs. SURFACE ENERGY

