Why Laser Engraving is not UV Laser Marking

UV laser marking of pharmaceuticals was introduced by Tri-Star Technologies in 1999. It was derived from their laser wire markers used in aerospace industry where absolutely no mechanical damage of electrical insulation is allowed. Laser Engraving assumes digging into substrate by melting, burning and evaporating material from its surface. UV laser exposure makes the surface darker without any mechanical degradation. That darkening is attributed to irreversible phase transitions in Titanium Dioxide that makes it extremely stable. Titanium Dioxide is FDA approved color additive used as whitening pigment in many formulations of tablets and capsules.

Fig.1 shows 4x4mm data matrix code printed on the surface of 0.7 mm thick soft gelatin film doped with Titanium Dioxide. Its structure and composition are quite similar to the ones produced in thousands of encapsulation machines throughout pharmaceutical industry. This high-resolution marking is chemically stable and mechanically inerasable. The process does not require any surface and/or print conditioning either before or after marking. There is no visible deformation on the surface even under high degree of magnification. In fact, the mark appears and really distributed in a very thin "under-skin" layer. It is impossible to remove and/or alter the mark without easily detectable physical destruction of the surface. Marking penetration is shown on Fig.2. Note that darkening stops far away from the opposite film side and therefore is never in contact with API.

The technology is tested and approved by major pharmaceutical companies and protected by several US patents



Fig.1. Data matrix bar code imprinted on the surface of soft gelatin strip with Tri-Star Cold[™] Laser under different magnifications



Fig.2. Cross section of the mark imprinted on the surface of soft gelatin strip with Tri-Star Cold[™] Laser under different magnifications