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## SURFACE TENSION METER IN PHARMACEUTICAL INDUSTRIES



Surface Tensiometer is an instrument which finds out the Surface Tension of liquids and more about characterisation of liquid wettability.

### **SURFACE TENSION AS A METHOD:**

There are two methods by which the Surface Tension can be figured out. One is the optical method and this is being done by a Contact Angle meter. This system uses the accessory of Pendant drop to produce a drop. The drop profile is captured by the camera and the image is then fed into the computer. The computer with its image analysis software then calculates the parameters to find out the surface tension. The advantage of this system is that it requires a very small amount of liquid.

The other method is Wilhelmy Plate method wherein a Platinum plate is immersed into the liquid surface. This is generally considered to be the approved method for surface tension. The reasons for this method to be approved are (a) the platinum plate surface has large surface tension and enough to spread most liquid samples over it. (b) the results derived are quite stable.

As we have seen above, the handicap of the Wilhelmy Plate method could be the volume of sample needed for analysis. This could be as much as upto 10 or more ml.

In a Pharma Research and Development environment the specific applications could be as follows:



**Ophthalmic formulations**, which have interaction with the air, surface tension is considered a critical parameter. The surface tension of the ophthalmic liquid affects the rate of its evaporation, as well as how easily it would spread along a biological surface. These help in treatment of evaporative dry eye disease. Dry Eye Relief ophthalmic solutions have a surface tension of 44 dyne/cm, which is close to human natural tears. The low surface tension is responsible for its spreading ability, better adhesion to the cornea and long lasting. For example Polyvinyl alcohol is added in certain amount such that the preparation has a surface tension of 55 to 30 mN/m. So various such ophthalmic liquids' surface tensions have to be estimated, for making the proper ophthalmic formulations.

For **Skin Creams**, to know the wetting of a liquid on the skin, the surface tension of the liquid should be less than or equal to critical surface tension of the bare skin. The critical surface tension of arm is in the range 26 to 30 mN/m & forehead is 33 mN/m. Generally the skin surface is hydrophobic & has low surface tension, for good wetting & spreading of facial skin, controlling surface tension & viscosity of the formulations play a vital role and thus they have to be maintained. Surface Tension of various skin cream formulations is also important and they have to be measured before releasing the batch.



**Kyowa Interface, Japan** is a world-renowned manufacturer of Contact Angle meters and Surface Tensiometers and was founded in 1947. The **DY series** of Surface Tensiometers are very popular for wide ranging applications including Pharma R&D.



With Kyowa's long-standing experience and great engineering expertise, the only handicap of a stand-alone Tensiometer – namely, the volume of sample needed, has also been overcome. This simple yet ingenious accessory is the Teflon Lab Dish which is very narrow and it takes a maximum of only upto 2ml volume and wide so that it wets the entire breadth of the Wilhelmy plate.

The Teflon Lab Dish has been welcomed by the Pharma companies and many of them have adopted Kyowa DY Series in their labs.

**IMPORTANT NOTE ON THE SCALES:**

In the Pharmacopeia the Surface tension results are mentioned in terms of dyne/cm. This is the same as mN/m which has been widely adopted for surface tension. That is, the unit displayed in the system as 72.8 mN/m is the same as that of 72.8 dyne/cm.

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