**Flexural property**

The behavior which shows by textile material during bending is called flexural property.

1. Flexural rigidity

2.   Bending recovery

3.   Bending modulus

**1. *Flexural rigidity*:** Flexural rigidity is the stiffness of a textile fiber. It can be defined as the couple needed to bend a fiber.

Mathematically,

Flexural rigidity = (1/4π) (ηET2/ρ)

Where, η = shape factor,

E = specific shear modulus,

T =linear density (Tex),

ρ = density (gm/cm3)

***Specific flexural rigidity*:** Specific flexural rigidity can be defined as the flexural rigidity of linear density.

Mathematically,

Specific flexural rigidity = (1/4π)(ηE/ρ)

Where, η = shape factor,

E = specific shear modulus,

ρ = density (gm/cm3)

**2. *Bnding recovery*:** The recovery from a given curvature is called bending recovery.

Say, nylon shows 100% recovery from small curvature of 15D, where it shows 20% recovery from large curvature.

Unit = N-m2/ Tex.

**3. *Shape factor*:** shape factor is a number that indicates the shape of a fiber. Shape is expressed by “η”.

If, η = 1, it indicates the shape of fiber is round.

If, η > 1, it indicates the shape of fiber is increased.

If, η < 1, it indicates the shape of fiber is decreased.

**Torsional property**

The behaviors which are shown by a textile material when it is subjected to a torsional force is called torsional property.

1. Torsional rigidity

2. Breaking twist

3. Shear modulus

1. ***Torsional rigidity*:** Torsional rigidity can be defined as the torque required against twisting is done for which torque is termed as torsional rigidity.

Mathematically, torsional rigidity = ηET2/ρ

Where, η = shape factor,

E = specific shear modulus (N/tex)

***Specific torsional rigidity*:** Specific torsional rigidity can be defined as the torsional rigidity of a fiber of unit linear density.

Mathematically,

specific torsional rigidity = ηE/ρ

Unit: N-m2 /Tex

1. ***Breaking twist*:** The twist for breaking of a yarn is called breaking twist. It also can be defined as the number of twists required to break a yarn. Breaking twist depends on the diameter of fiber and it is inversely proportional to its diameter.

That is, Tb ∞ 1/d

Where, Tb = Breaking twist,

d = diameter of fiber.

***Breaking twist angle*:** This is the angle through which outer layer of fiber are sheared at breaking.

Mathematically, α = tan-1(πdTb)

Where, α = breaking twist angle,

d = diameter of fiber,

Tb = breaking twist per unit length.

Breaking twist angle of different fibers:

|  |  |
| --- | --- |
| ***Fiber*** | ***Breaking twist angle (α)*** |
| Cotton | 35\* |
| Viscose | 33\* |
| Polyester | 50\* |
| Wool | 40\* |
| Silk | 39\* |
| Glass | 4\* |

3. *Shear modulus*: Shear modulus is defined as the ratio of shear stress & shear strain. Shear modulus is measured in radians.