Elastic isotropic and anisotropic behavior:

For elastic isotropic material:

Hook's Law is applied : σ = *E*Ɛ

There are several conditions will produce from this law: (for isotropic and uniaxial loading conditions).

K : shear modulus = ; G: shear modulus =

For isotropic multiaxial loading conditions:-

For anisotropic multiaxial loading:- the elastic constants vary as a function of crystallographic orientation such as :-

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C: elastic stiffness, S: elastic compliance.

The reversibility of elastic strain leads to Sij = Sji and Cij = Cji so elastic constants will transform from 36 to 21 , and another cases such as :-

9 elastic constants for orthorhombic case.

5 elastic constants for hexagonal case.

3 elastic constants for cubic crystal.

Through the elastic range:-

: original cross sectional area

There is a relation between gauge length and diameter changes associated with plastic deformation (which is constant volume process) :-

Prove:-

|  |  |
| --- | --- |
| Table -1- | |
| Elastic modulus for several polymers | |
| Nylon 66 | ( 1.2 – 2.9 ) Gpa |
| Poly carbonate | 2 – 4 |
| HDPE | 0.4 – 1.3 |
| PMMA | 2.4 – 3.4 |
| PP | 1.1 – 1.6 |
| PS | 2.7 – 4.2 |
| Al | 70.3 |
| iron | 211.4 |
| Wc | 534.4 |
| Sic | 470 |