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Determination of Wood Module of Different Metals Bending

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ABSTRACT: When determining Young's modulus by the bending method, tests of building materials were carried out. In modern urban construction, building construction must be flawless in all respects. For this, first of all, the durability of the building materials is of paramount importance. E = 66 GPa, E = 115 GPa for copper and E = 198 GPa for steel.

KEYWORD: Young's modulus, elastic deformation, plastic deformation, elongation, force, Hooke's law, elastic limit, bending moment, tension, coefficient of elasticity.

If the distance between the particles of a body does not change under the influence of an external force, such a body is called an absolutely rigid body. However, there is no absolute body in nature. When objects are deformed, two boundary states can be observed: elastic deformation, or plastic deformation. [1]

The unit is the force that normally acts on the cutting surface.

$$\delta = \frac{P_{og`}}{S} \qquad (1)$$

The magnitude of the relative elongation is directly proportional to the stress acting on the cross-sectional surface of the rod: [2]

$$\frac{\Delta l}{l_0} = \delta * \alpha \qquad (2)$$

there ***a*** is the coefficient of elasticity.

In order to determine the properties of a given material, in addition to a, it was inverted

$$\mathrm{E} = \frac{1}{\alpha} \qquad (3)$$

size is also included, and this size is called the Yung modulus. [3] From the formula (3) the value of a is expressed in (2) the following formula is formed:

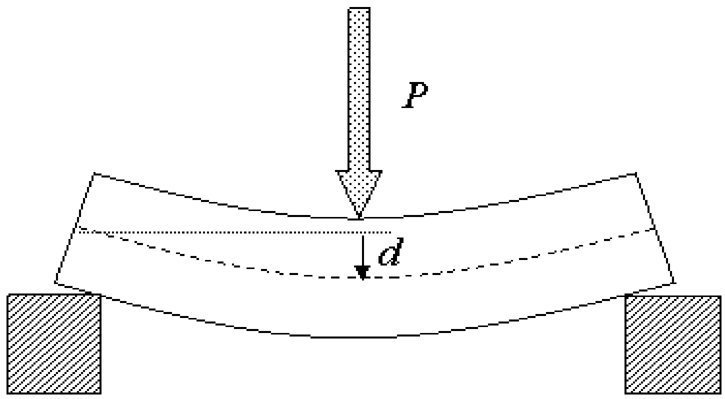
$$\delta = \mathrm{E}\frac{\Delta l}{l_0} \qquad (4)$$

This equation is called Hooke's law for elongation deformation. For elastic deformation to occur, the value of the force must be within the limit of elasticity. [4] From formula (4) we determine the Yung modulus:

$\mathrm{E} = \frac{Pl_0}{S\Delta l}$ (5)

The degree of deformation is determined by the amount of bending. In elastic deformation, the amount of bending is determined by the following formula, as we study. [5]

1) $\delta = \mathrm{E}\varepsilon_0$ 2)$\delta = \frac{F}{S}$ 3)$\varepsilon = \frac{\Delta l}{l_0}$

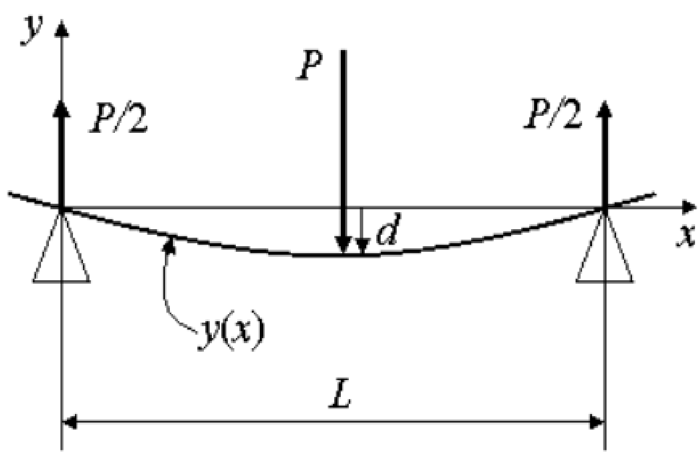


$$\mathrm{EI}y''(x) = M(x)$$

$\mathrm{M}(x) = \frac{P}{2}x$ - bending moment

4)$y''(x) = \frac{P}{2\mathrm{EI}}x_0$ 5)$y(x) = \frac{P}{12\mathrm{EI}}x^3 - \frac{PL^2}{16\mathrm{EI}}x_0$

There is $\mathrm{I} = \frac{bh^3}{12}$, L- Distance between prisms, E-Yung modulus



$d = -y\left(\frac{L}{2}\right) = \frac{PL^3}{4\mathrm{E}h^3b}$ [6] (6)

$\mathrm{E} = \frac{PL^3}{4dbh^3}$ (7)

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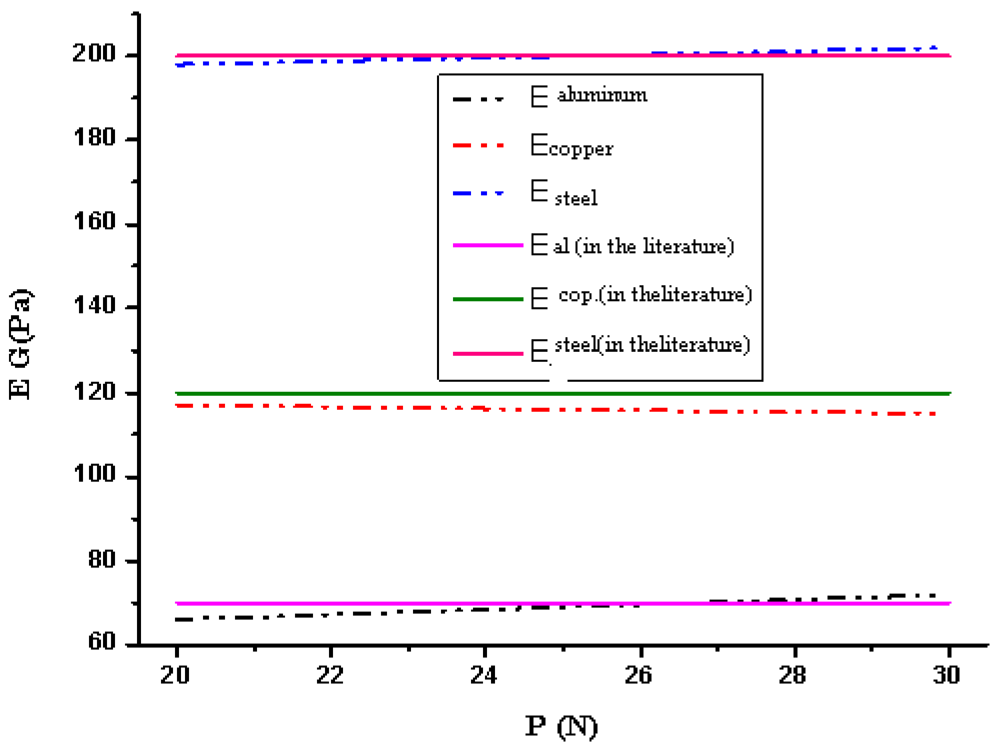
there P is the force of gravity, L is the length of the rod, b is the width of the rod, h is the thickness of the rod, d is the magnitude of the bend

	Aluminum	Copper	steel
m_1,kg	3	3	3
m_2,kg	2	2	2
P_1,N	30	30	30
P_2,N	20	20	20
d_1,m	$3{,}9*10^{-2}$	$2{,}2*10^{-2}$	$1{,}3*10^{-2}$
d_2,m	$2{,}4*10^{-2}$	$1{,}5*10^{-2}$	$0{,}85*10^{-2}$
b,m	$4*10^{-2}$	$4*10^{-2}$	$4*10^{-2}$
h,m	$2*10^{-3}$	$2*10^{-3}$	$2*10^{-3}$
L,m	$48*10^{-2}$	$48*10^{-2}$	$48*10^{-2}$
E,GPa	70	120	200
$E_{1(lab)}$ GPa	66	117	198
$E_{2(lab)}$ GPa	72	115	202

From the obtained results we draw the following graph. The graph shows that the experimental results of the Yung modulus are close to the actual values of the measured metals



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