

# Abstract

**T**his research covers reinforcement of unsaturated polyester resin, and studying mechanical and physical properties by preparing the unsaturated polyester resin reinforced by random chopped fiberglass at constant volume fraction of (15%) as a matrix. Then the matrix reinforced again by adding nylon fiber at a selected volume fraction of (6, 8, 10, 15, 20) % and different fiber order of (perpendicular mat ( $0^{\circ}$ - $90^{\circ}$ ), random chopped). In addition to that, the research involves the effect of layer system on the properties of hybrid composite in constant volume fraction of fiber glass and nylon fiber (the layer system includes the studying of effect of interchange interlock between the glass and nylon fiber respectively tacking the effect of the material type of outside layer .

**T**he research also in consideration focalizes on studying the mechanical and physical properties of the preparing composite represents by tension properties (tensile stress at fracture point and tension modules of elasticity), compression properties (compression stress at crash point), bending elastic modules, hardness, thermal conductivity and chemical solution absorption ( $H_2O$ ,  $H_2SO_4$ ,  $NaCl$ ,  $NaOH$ ,).

**T**he results show anoticeable increase in values of tensile stress at fracture point, tensile modules of elasticity, impact toughness and fracture impact toughness as the volume fraction of nylon fiber increase for both systems of fiber order , because of the high toughness of the nylon fiber. at the other side, the results of hardness and compression property show a reverse previous behavior, in addition to that, the use of the added (15%) percent, perpendicular mat( $0^{\circ}$ - $90^{\circ}$ ) order of nylon fiber appeared the best properting. The use of the layer system to fiber order leads to improves the mechanical properties of hybrid composite specially, when the two outside layers material are fiber glass, except the compression property.

**T**he study of physical test show that the thermal conductivity decreases with the increase of volume fraction ,It also decreases with increase of nylon fiber layers for the samples of laminar reinforced system .