

Abstract

In this research. Study the properties of buckling for the columns manufactured by polyester resin unsaturated reinforced by aluminum and copper particles. The properties of buckling of these columns were studied theoretically in which the critical load of Euler's equation, and then the properties were known practically by the direction test of the columns in buckling test device and then the practical and theoretical results were compared for knowing the accuracy of tests.

Reinforcement with aluminum and copper particles were made for the various volume fractions (3%,6%,9%,12%). Three samples were manufactured for each addition proportion to obtain the maximum accuracy in tensile and buckling. The internal microstructure was shown to know the distribution of particles inside the matrix material by the use of photomicroscope.

The results of buckling tests showed that the critical load increases with the increase of volume fraction aluminum and copper particles reinforcement. However, the increase achieved by reinforcement with aluminum particles was greater than the amount of critical load was (479.22N), with increase percentage of (108.75%) while copper was (341.1N) with increase percentage of (48.59%) at volume fraction of (12%).

As we have noticed, the value of critical load of buckling depended directly on modulus of elasticity where critical load increased positively with it. Modulus of elasticity is regarded as the only variable in Euler's equation that is effected by volume fraction.

The test of tensile showed that tensile strength increases with the increase of volume fraction of particles in case of reinforcement of aluminum with percentage of (57.25%) while copper caused decrease of tensile strength with percentage of (19.35%) at volume fraction of (12%). While modulus of elasticity increased in both types of reinforcements. This increase is greater in the case of aluminum that the maximum value modulus of elasticity was (2475 Mpa) at volume fraction of (12%) and with increase percentage of copper (65%). Copper also shows increase the brittleness of polymer materials, that ductility decrease while aluminum causes good increase in the polymer material.

The results of comparing the practical and theoretical values of critical load of buckling showed an error rate between the two values. The error rate was acceptable for the test conditions and the conditions of manufacturing of samples.

The distribution of aluminum particles was homogenous inside the matrix material while in case of copper the increase of volume fraction showed that some particles form masses and there is difficulty to distribute the particle homogenously.