Abstract

Polymer - based components are exposed to many damage influences during their lifetime. One of these influences erosion, which is a crucial problem in many industrial applications such as pipes, boats, sewage…etc. due to impingements of solid particles being suspended in the fluids flowing at high velocity. This work reports investigation of physical and mechanical properties of a series of fabricated polymer-based samples, their erosion wear characteristics and their resistance to erosion wear after being coated with rice husk ash – mixed epoxy resin. Composites specimens have been prepared by (Hand lay-up) molding method. The composites specimens are composed of epoxy resin as the matrix, 6%volume fraction of glass fiber as reinforcing material and filler powders from natural wastes and industrial processed powders at 3% and 6% volume fraction. The natural wastes are rice husk ash (RHA), carrot waste and sawdust (wood powder) where industrial processed powders are Na_2CO_3, $CaCO_3$ and K_2CO_3.The investigated physical properties are density, water absorption and optical microscope while the mechanical properties are hardness shore (D), flexural strength and shear stress. Solid particles erosion wear tests and coating after erosion are also carried out. The experimental results show that increased volume fraction of glass fibers and filler powders to 6% leads to increase in physical and mechanical properties. As for the physical properties, the results show that specimen (epoxy +6% glass fiber+6% RHA) natural-based composites materials give higher density of (1.189) gm /cm^3, lower water absorption of (0.380) and specimen (epoxy + 6% glass fiber + 6% $CaCO_3$) industrial- based composites materials give higher density of (1.320) gm /cm^3, lower water absorption of (0.240).As for the mechanical properties (epoxy +6% glass fiber +6% RHA) natural-based composites materials give higher shore hardness of (82.7), higher

flexural strength of (225) MPa , higher shear stress of (6.20) MPa and specimen (epoxy +6% glass fiber +6% $CaCO_3$) industrial- based composites materials give higher shore hardness of (83.5) , higher flexural strength of (265) MPa , higher shear stress of (6.39) MPa .The particle-contained water jet type experimental erosion test results backed by optical microscope examination reveal that the reinforcement volume fraction as well as particles distribution and bonding has considerable effect on the wear of epoxy composites. It shows that the better resistance is for (epoxy +6% glass fiber +6% RHA) natural-based composites and (epoxy +6% glass fiber +6% $CaCO_3$) industrial based composites at 30cm , angle 60°, grin size of sand 425μm , temperature 30Ċ , 300 gm salt content in 2 liter of water and 15 hour. Results suggest that coating specimens with RHA-mixed epoxy resin at optimized size of RHA particles in the range (1.4-4.2) μm improves erosion wear resistance characteristics of the coated specimens. The optical microscope results of the coated specimens show that coatings are resistance to erosion parameters.