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Sem characterization and tensile properties of alkali treated single coir fiber with drying procedure variation

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Abstract

– This study has aimed to analyze the effect of alkali treatment and drying method on the surface morphology and tensile properties of single coir fibers. The treatments of the coir fibers have been configured on the concentration of alkali solution, the soaking period, and the drying method. Furthermore, they have been soaked in 2 wt% and 6 wt% sodium hydroxide solution at room temperature for 1-and 2-hours soaking periods. The drying procedures adopted have been air, oven, and sun-drying. Observations with a scanning electron microscope (SEM) show that the coir surface is coarser, especially on fibers treated with 6 wt% sodium hydroxide solution. The properties such as tensile strength and strain, as well as tensile modulus of the different samples have been measured. The results have showed that the treated coir fiber with the 2 wt% concentration alkali solution has lower tensile strength than the untreated one. The treated coir with 6 wt% sodium hydroxides has the most considerable tensile strength. The effect of the soaking period on the tensile properties has been influenced by the drying method. Therefore, the appropriate combination of the soaking period and the drying method increase single coir fibers tensile properties. Slow drying (air-drying) has generated better tensile properties than the fast method (oven and sun-drying).

Author keywords

Modulus of elasticity; Single coir fiber; Stress and strain diagram; Surface morphology; Tensile strain; Tensile strength

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Influence of Cutting Parameters on the Service Life of Twist HSS Drill Bit When Drilling C35 Steel

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Abstract

This work aims to understand the influence of cutting parameters on the twist high-speed steel (HSS) drill bits wear when drilling C35 steel before and after quenching. An experimental investigation has been conducted using the planning experience methodology (L8) on C35 steel in the annealed and hardened states. The input parameters are cutting regime elements, cutting speed (Vc), feed rate (f), and drill diameter (D), while the output parameters are the tool wear related to its tool life. The most interesting phenomenon is the controversial effect of cutting speed when drilling C35 steel in hardened conditions. The drilling life increases with increasing cutting speed for different cutting regimes (1 to 8). In addition, the 20 mm diameter drill related to the high value of the depth of cut (f) has given better life before and after hardening, contrary to the literature on cutting tool life. The analysis of variance (ANOVA) has showed that the feed rate (f) is the most significant factor in the annealed state while it is the depth of cut (ap) in the hardened state. The correlation coefficients R2 determined by the ANOVA before, and after quenching, are very satisfactory, and testify the good adequacy of the proposed model.

Keywords

C35 Steel; Cutting Parameters; Hardening; Tool Life; Twist HSS Drill Bit; Wear

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Prototyping and Study of Jet Systems for Developing Mesh Turbomachines

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Abstract

This paper presents a research aimed at developing energy-efficient turbomachines for complicated operating conditions at high gas temperature, high gas, or gas-liquid flow rate, or in the presence of solid abrasive particles in the flow. In the paper, the authors propose to consider possibilities for developing hybrid turbomachines with both jet device and impeller machine properties. The research has been carried out at the junction of two scientific and technical directions. The first one is associated with the field of mesh turbomachinery, while the second direction is associated with the field of jet control systems that enable to control the velocity vector (thrust vector). The software package FlowSimulation (FloEFD) has been used for computer simulation and computational research. The 3D model has been created using the SolidWorks CAD system. Examples show that using a curved mixing chamber, the ejector allows for an energy conversion process similar to the working process in an impeller machine. During the main working time, the gas jet is directed along a curved pipe that serves as a mixing chamber. The hypothesis about the possibility of creating a torque on the turbomachine shaft due to a pulsed reverse flow in the mixing chamber of the ejector located in the turbine rotor cavity has been tested. Based on the results of the computer simulation, conclusions about the prospects of hybrid turbomachines are drawn. Prototypes (micromodels) of the turbine have been developed by using additive technologies. Pneumatic and hydraulic tests of the micromodels confirmed the operability of the proposed technical solution. One of the development directions may be associated with the Euler turbine modernization. It is concluded that the scientific and technical potential of the Euler turbine has not yet been fully disclosed, and research work in this direction should be continued. Findings are applicable in various industries, including energy economy, robotics, aviation, and water transport.

Keywords

Ejector; Energy Conversion; Gas Dynamics; Hydrodynamics; Turbine

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