

EVALUATION OF THE ADDITION OF NANOFILLER ON THE PROPERTIES OF POLYAMIDE USED IN OFFSHORE APPLICATIONS BY A FACTORIAL DESIGN EXPERIMENTS

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ABSTRACT

Polyamide-11 (PA11) is in use since more than 30 years in offshore applications, in particularly for the manufacturing of the pressure sheath in flexible pipes¹⁻². There is growing interest in the incorporation of nanoparticles into engineering polymers to improve various functional properties³⁻⁴. The aim of this work was to evaluate the effect of the nanofiller, calcium carbonate (n-CaCO₃), on the mechanical and barrier properties of PA-11 by using a 2ⁿ factorial design, with n=2 factors (process variables). The process variables analyzed were: n-CaCO₃ content and screw speed. The materials preparation was performed using a Teck Tril twin screw extruder with L/D ratio 36 and D=20 mm. The barrel temperature profile was set at 90/160/170/180/190/200/210°C. Firstly, the composites prepared were analyzed by X-ray diffraction (XRD) in order to evaluate the presence of nanoparticles dispersed in the PA-11 matrix. The samples to tensile and barrier (CO₂ permeation) analysis were prepared by injection and compression molding, respectively. The previous results showed that the addition of the nanofiller improved the mechanical properties of the PA-11 and a better barrier behavior was achieved.

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References

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