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## Statistical Experimental Design of the Effect of Peroxide Concentration on the Crosslinking of the LLDPE

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The effect of low concentrations of dicumyl peroxide (DCP) on the molecular weight of a linear low density polyethylene (LLDPE) during a reactive extrusion process was studied. The experiments were arranged in a two level factorial design in order to evaluate the effect of peroxide concentration ( $X_2$ ), temperature zones ( $X_1$ ) and screw rpm ( $X_3$ ) on the crosslinking of LLDPE [1]. The melt flow index (MFI) was used as a response variable. It is known that in crosslinking LLDPE with organic peroxides the extrusion process conditions must be controlled, since peroxide incorporation and the processing of the peroxide mixture should take place without premature crosslinking (scorching). The absence of microgel as indicated by the gel content analysis of all extrudates demonstrates that the extrusion process conditions used, as well as the method of dispersing the peroxide, were reasonably successful in generating homogeneous products. Rheological data demonstrate that there was an increase of elasticity of the samples with the increase of peroxide concentration. The elasticity index ( $ER$ ) showed also an increase of chain branching or an increase of concentration high weight molecules. It was verified that the thermal properties, crystalline melting temperature ( $T_m$ ), the heat of fusion ( $\Delta H_{melt}$ ) and the crystallinity degree ( $X\%$ ) tend to decrease with the increase of the peroxide concentration. The crystallization temperature ( $T_c$ ) increased up to 0.5% w/w peroxide, whereafter the level stays almost constant. This result can be an indication that there was an increasing chains irregularities in a polymer chain upon peroxide treatment. In the condition adapted in this work however there was no formation significant of a three-dimensional network [2].

### REFERENCES

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- [2] Ramos, V. D., da Costa, H. M., Pereira, A. O., Rocha, M. C. G., Gomes, A. S., *Study of Low Concentrations of Dicumyl Peroxide on the Molecular Structure Modification of LLDPE by Reactive Extrusion*, *Polym. Test.*, in press (2004).