

INFLUENCE OF PROCESSING CONDITIONS ON THE β -PHASE CONTENT OF PVDF SAMPLES PRODUCED BY TAPE EXTRUSION

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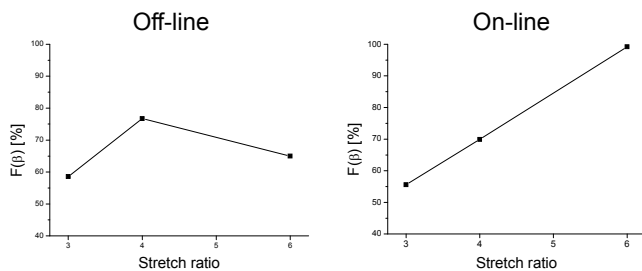
Introduction

In the field of piezoelectric materials Poly(vinylidene fluoride) (PVDF) is one of the most employed polymer based materials. Previous works have shown that the β -phase content of PVDF strongly influences its electroactive response. In that phase PVDF shows the highest piezoelectric properties, and it is commonly obtained through mechanical stretching of α -phase at a given temperature.

This research team has been working during the last couple of years on the development of industrial scalable technologies, based on the extrusion processing technique, for the production of piezoelectric products. This specific work comprises a study on the effect of tape extrusion processing conditions on the content of β -phase PVDF. For this purpose the produced samples were uniaxially stretched up to ratios of 6, at 80°C and 120°C, being the β -phase content analysed by FTIR. Subsequently, the samples were corona poled and their piezoelectric coefficient d_{33} was measured.

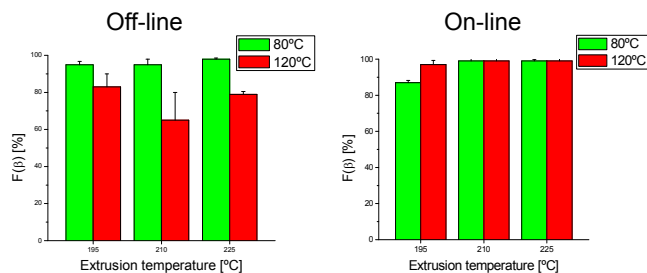
The results obtained allow to conclude that the extrusion processing variables, with the exception of the stretching temperature and ratio, do not have a strong influence on the β -phase content and piezoelectric response of PVDF.

Results

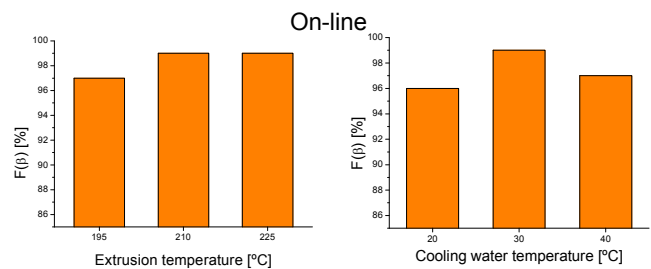


β -phase content increases with stretch ratio.

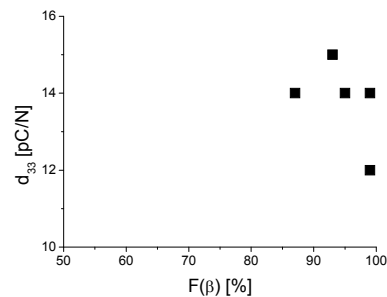
The β -phase content is larger for the on-line stretched material



β -phase content depends on stretching temperature for the off-line stretched material.



Extrusion and cooling water temperatures have little influence on the β -phase content.



For large β -phase content similar d_{33} piezoelectric response is obtained in both on-line and off-line stretched material.

Conclusions

The processing up-scale was successful.

PVDF samples have been produced that can be used as sensors due to their electroactive response.

The most significant parameters influencing the β -phase content are the stretching conditions, namely its ratio and temperature.

Acknowledgements

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