PVDF transcrystallinity induced by Carbon Nanotubes Fibres.

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Poly (vinylidene fluoride) (PVDF) is a typical polymorphic semicrystalline polymer with three main crystalline phases: α-phase (non-polar), β and γ-phase (polar), being these polar phase interesting in electronic industry since they are piezo- and pyroelectric. The crystallization of β or γ phase is favored by special treatments such as mechanical stretching or polarization under a strong electrical field, as well as the use of nucleants.

CNTs mainly act as nucleating agent for the formation of β-phase PVDF, therefore the formation of these polar phase on the surface of the hierarchical structure of CNT fibre is extremely interesting for piezo- or pyroelectric displays. The most common route to prepare CNT composites is their random incorporation as dispersed fillers in polymer matrices. These composites present important limitations in dispersing individuals CNTs above volume fractions greater than ≈1%, hindering further improvements in matrix mechanical, electrical and thermal properties. A method to exploit the axial properties of CNTs is to assemble them into a macroscopic fibre, with the tubes aligned parallel with the fibre axis. This fibre has shown excellent mechanical properties, also high electrical conductivity, and surface area >100 m^2/g.[1]

The analysis of the formation of polar and oriented phases in CNT fibre composites with PVDF by DSC and synchrotron radiation will be the aim of this work.

References

[1] V. Reguero, B. Alemán, B. Mas, and J.J. Vilatela, Chemistry of Materials **26,** 3550 (2014).

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