

For Single to Multilayer Polyvinylidene Fluoride Based Polymer for Electro-Caloric Cooling

Authors : Nouh Zeggai, Lucas Debrux, Fabien Parrain, Brahim Dkhil, Martino Lobue, Morgan Almanza

Abstract : Refrigeration and air conditioning are some of the most used energies in our daily life, especially vapor compression refrigeration. Electrocaloric material might appear as an alternative towards solid-state cooling. polyvinylidene fluoride (PVDF) based polymer has shown promising adiabatic temperature change (ΔT) and entropy change (ΔS). There is practically no limit to the electric field that can be applied, except the one that the material can withstand. However, when working with a large surface as required in a device, the chance to have a defect is larger and can drastically reduce the voltage breakdown, thus reducing the electrocaloric properties. In this work, we propose to study how the characteristic of a single film are transposed when going to multilayer. The laminator and the hot press appear as two interesting processes that have been investigated to achieve a multilayer film. The study is mainly focused on the breakdown field and the adiabatic temperature change, but the phase and crystallinity have also been measured. We process one layer-based PVDF and assemble them to obtain a multilayer. Pressing at hot temperature method and lamination were used for the production of the thin films. The multilayer film shows higher breakdown strength, temperature change, and crystallinity (beta phases) using the hot press technique.

Keywords : PVDF-TrFE-CFE, multilayer, electrocaloric effect, hot press, cooling device

Conference Title : ICDPPM 2021 : International Conference on Digital Printing and Polymer Materials

Conference Location : Paris, France

Conference Dates : December 30-31, 2021