Shaping and characterisation of the physical properties of ferroelectric hybrid molecular material for electric & energy applications

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$DabcoH^+A^-$ is a lead free hybrid organic-inorganic molecular ferroelectric material. Below its Curie temperature (105°C for $dabcoHBF_4$) where a great permittivity jump is observed, it can display ferroelectric (FE) and/or anti-ferroelectric (AFE) characteristics [1].
In a recent study, we analyzed the influence of frequency, heating rate and pellet molding pressure on the dielectric response of polycrystalline dabcoHBF4 powder molded in pellets [2] around the phase transition.
Here we intend to push further the characterization of the effects linked to that transformation. First, we present the discovery of an unexpected inhibiting effect the Curie Temperature transition linked to the vacuum applied on the material. Then we are developing the characterisation of the voltage effect, either on the transition temperature or below, leading to possible electrocaloric effects.
Finally, application possibilities are addressed by developing new thin film shaping with Joule evaporation process (fig1). Those thicknesses would allow us to exploit ferroelectric and electrocaloric properties of $dabcoH^+A^-$ in an simple and low energy process.

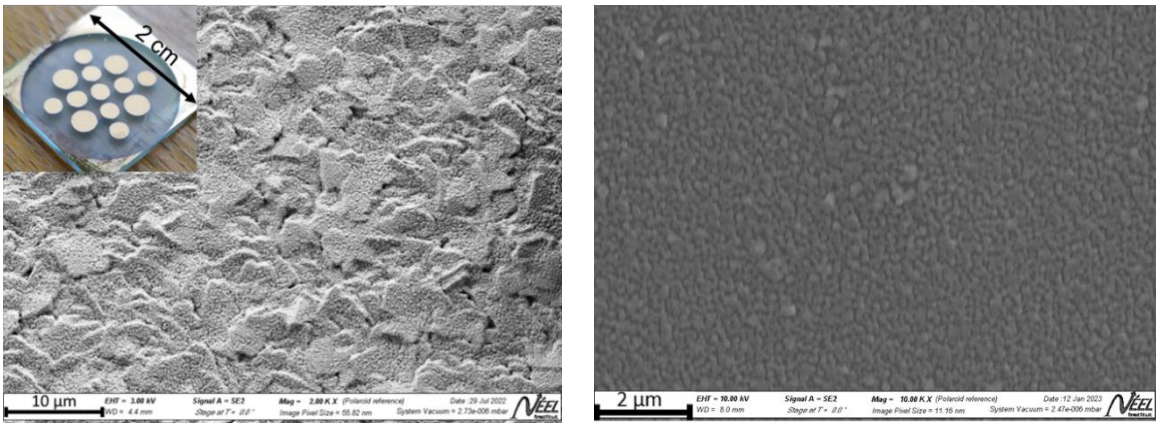

Fig 1 : SEM images of the surface of $DabcoHBF_4$ thin films deposed with different devices.

[1] A. Olejniczak *et. al* Crystal Growth & Design, 18, 11, 6488-6496 (2018)
[2] N. Bréfuel, *et.al*, J. Mat. Science, 56, 18582-18591. (2021)