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Characterisation and thin shaping of molecular dielectric switchable materials

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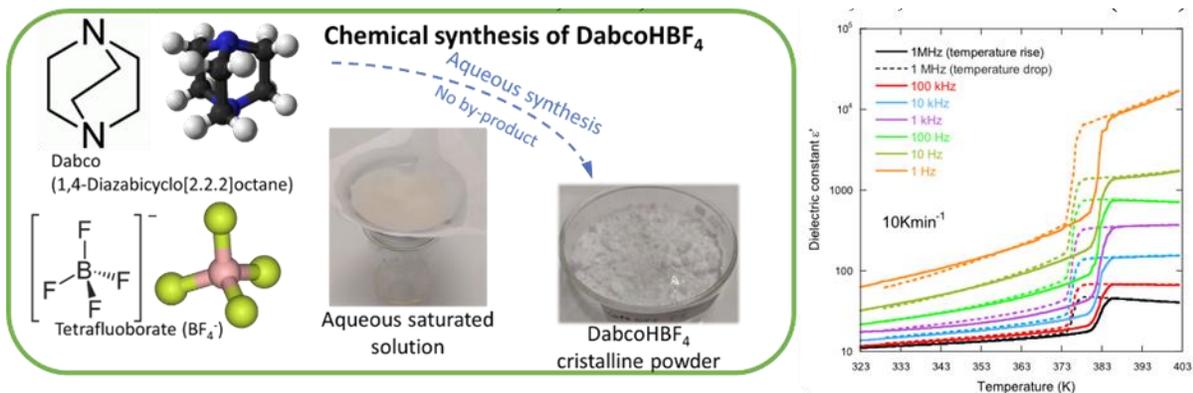
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DabcoHBF₄ is a lead free ferroelectric material synthesized from commercial tetrafluoroborate acid (HBF₄) and DABCO (1,4 diazabicyclo[2.2.2]octane). It shows room-temperature ferroelectricity with a Curie temperature of 107°C at which a great permittivity jump (multiplied by 2 to 5) is witnessed.

This material has already been deeply studied from a crystallographic point of view but its dielectric and piezo-electric components are still to be explored. As a first step, in a recent study, we analyzed the influence of various parameters (frequency, heating rate, pellet molding pressure) on the dielectric response of polycrystalline dabcoHBF₄ powder shaped in pellets, which work is to be continued here.

Alongside, dielectric properties (permittivity, losses, conductivity) measurements on a large range of temperatures (200K to 450K) and frequencies (0.01 Hz to 1 MHz) are in progress. Based on frequency-temperature coupled conductivity measurements, we will discuss the intrinsic charge transport mechanisms of the material and its conductivity values in relation to the potential applications of these ferroelectric materials.

To increase dabcoHBF₄ value for applications, we are addressing the major challenge of sub-micrometric thin film processing of dabcoHBF₄. We have particularly promising first results of a sublimation new method on insulating or conducting substrates. The first measurements, in progress, will allow evaluating the dielectric performances of these novel devices.



References : N.Brefuel *et al.*, J.Mat. Science, 56, 18582-18591. (2021)