From Core-Shell BaTiO3@MgO to Nanostructured Low Dielectric Loss Ceramics by Spark Plasma Sintering

Romain Berthelot, Brice Basly, Sonia Buffière, Jérôme Majimel, Geoffroy Chevallier, Alicia Weibel, Amélie Veillère, Laëtitia Etienne, U-Chan Chung, Graziella Goglio, Mario Maglione, Claude Estournès, Stéphane Mornet and Cathy Elissalde

Fig. S1 Bright-field TEM micrographs obtained after washing sequence of particles with cyclohexane (*i.e.* without the use of absolute ethanol). MgO nanocristallites have dried onto the carbon film of the grid separately from any BT particles due to the solvatation of both alkylated particle surfaces by cyclohexane.

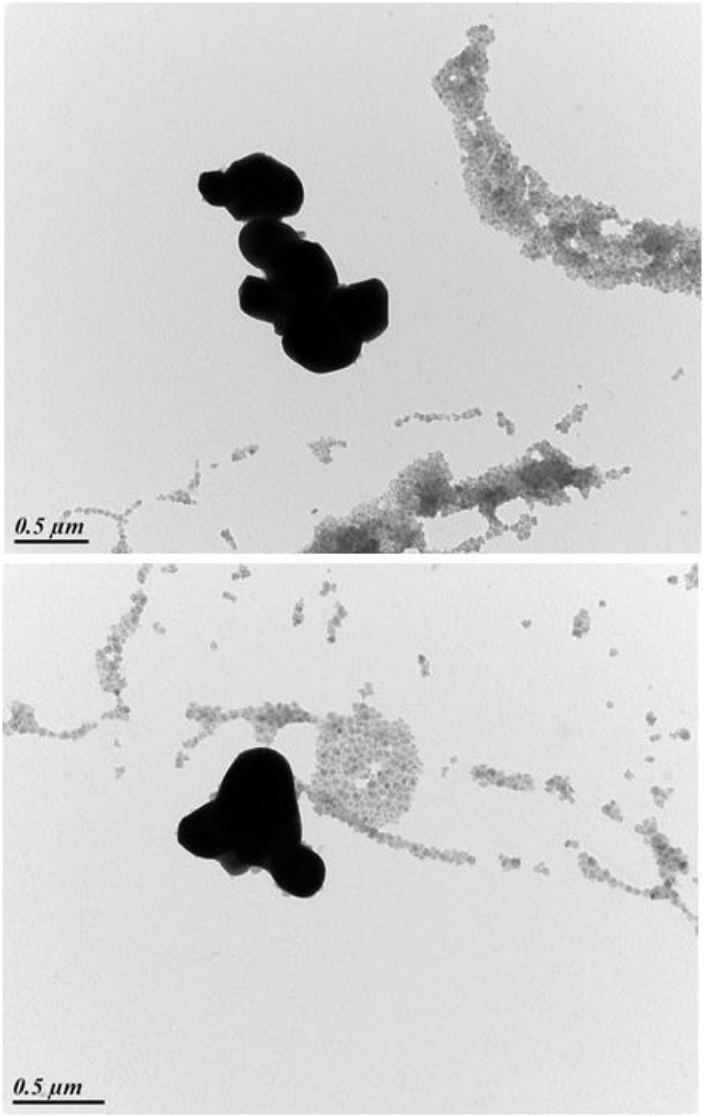

Fig. S2 *In situ* dilatometry curves obtained during the SPS densification of composite (blue line) and pure BT (black line) ceramics in the same conditions. The displacement has been normalized with each highest value to help the comparison. The first jump (A) is attributed to grain rearrangements by sliding in the composite material, while further phenomena (B) and (C) are the onset of the densification for the composite and BT ceramics, respectively.

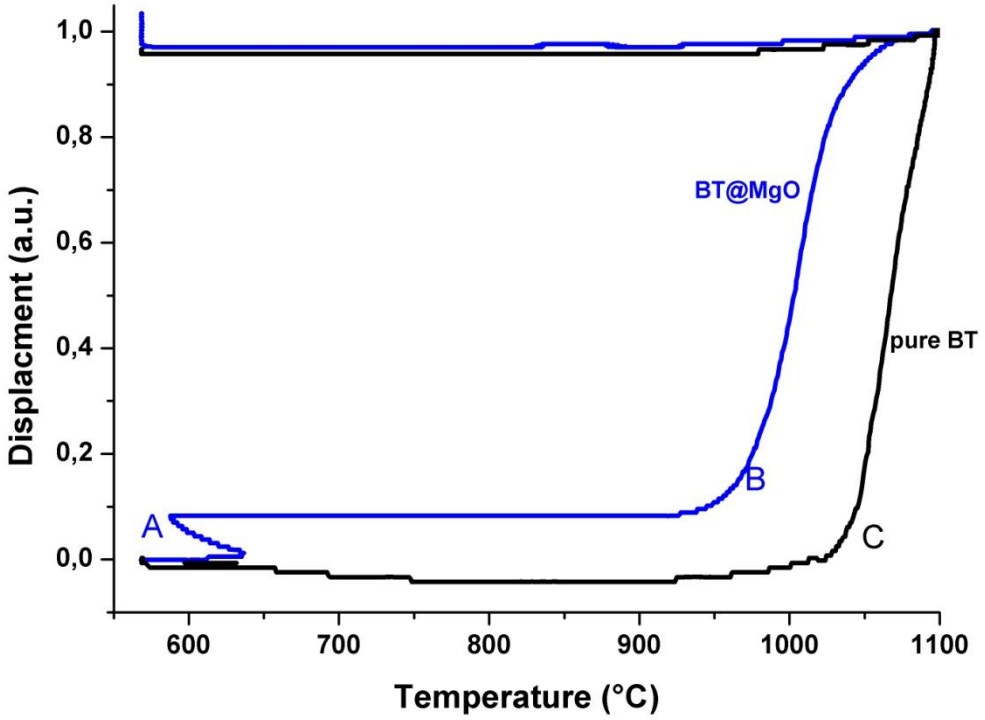

Fig. S3 Enlarged view between 2θ = 42 and 46 ° of XRD powder patterns of the raw BT, sintered BT, as-prepared BT@MgO, BT@MgO after the heating treatment of 1h at 600 °C (all in black lines), and the sintered composite ceramic (in blue line). Intensities are normalized with the main diffraction peak (101).

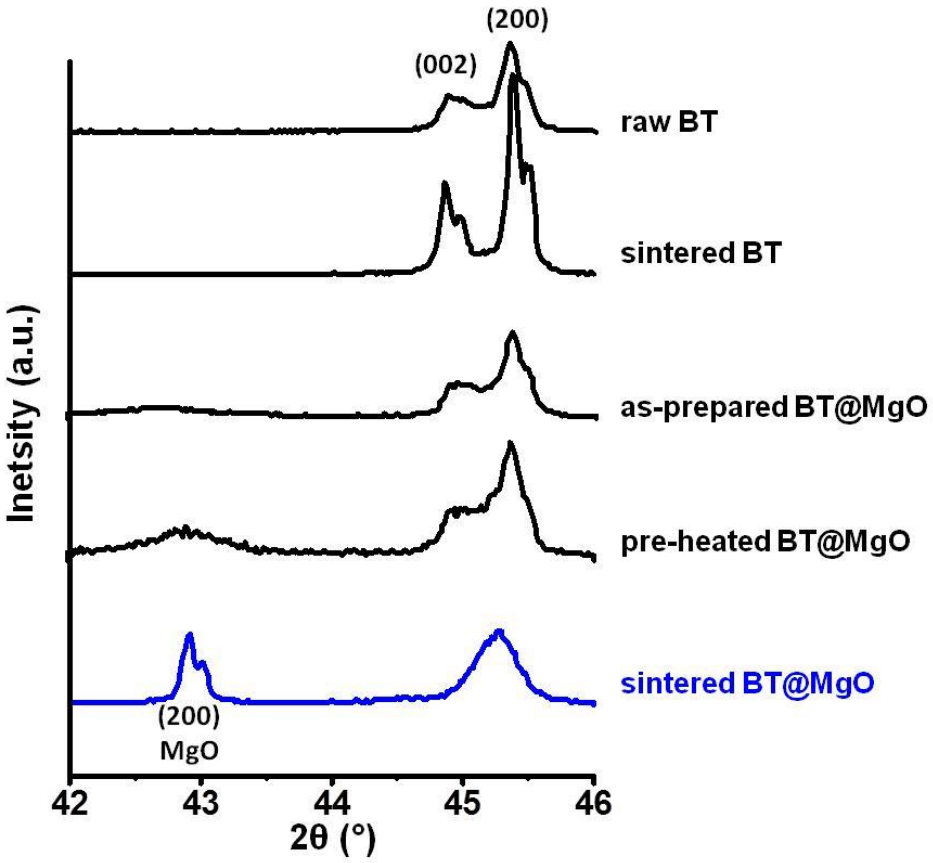

Fig. S4 Temperature evolution of the inverse of permittivity (1/ε') measured for composite and BT SPS ceramics (in blue and black circles, respectively), in addition with the corresponding Curie-Weiss fitting in the paraelectric domain.