ATMOSPHERE ASSISTED FLASH SINTERING OF KNN

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The use of FLASH alternative sintering technique allows a significant decrease in sintering time and temperature, contributing to the sustainable processing of high sintering temperature piezoelectrics. This is the case of potassium sodium niobate, $K_{0.5}Na_{0.5}NbO_3$ (KNN), a relevant lead-free piezoelectric, which, due to alkali evaporation, is difficult to produce by conventional sintering, at T > 1100 ºC.

In this work, KNN was FLASH sintered and the sintering atmosphere and powder humidity effect on the consolidation process was investigated. Different atmospheres were tested (from reducing to oxidizing and dry to wet) and the FLASH temperature, T_F, was accessed. We have observed that T_F is highly dependent on the sintering atmosphere and it can be as low as 270 ºC, if a reducing atmosphere is used. KNN powder conductivity was accessed for the different atmospheres as a function of the temperature during FLASH, as depicted in fig. 1. Humidified KNN powders were successfully FLASH sintered. The FLASH sintered KNN ceramics were structurally and microstructurally characterized (XRD, SEM and TEM). Electric and dielectric responses were accessed as a mean to explain the FLASH sintering dependence on atmospheres and humidity.

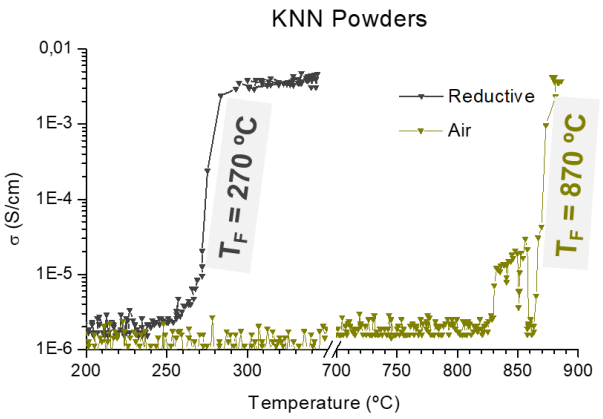

Figure 1 – KNN logarithmic conductivity dependence with temperature, for two different atmospheres: air and reducing. An inset for FLASH temperature is presented for each curve.

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