Departamento de Física de la Materia Condensada

Universidad Zaragoza

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BCMaterials, Ikerbaske

High performance electrocaloric materials based on high-entropy-like ceramics

The focus on next-generation EC cooling devices utilizing the electrocaloric effect of ferroelectric materials has increased. Despite the longstanding stagnation in bulk ceramic electrocaloric (EC) effect development, advancements are crucial. This study successfully synthesized two medium entropy-like $Pb(Sc_{0.25}In_{0.25}Nb_{0.25}Ta_{0.25})O_3$ (PSINT) ceramics using one-step or two-step spark plasma sintering (SPS) processing. Enhancing the configurational entropy of B-site ions simultaneously increases dipolar entropy, promising a substantial EC effect in medium-entropy and high-entropy ferroelectric ceramics. The two-step-SPS processed sample exhibits a high EC strength ($\triangle T/\triangle E$ ~ 0.021 K·cm/kV) and large EC effect ($\triangle T$ ~ 0.85 K) at a very low electric field (~ 40 kV/cm) around room temperature, with a broad working temperature range (~ 120 K) due to dielectric peak relaxation.

Professor Qi Zhang graduated with a bachelor's degree in Chemistry from Wuhan University in 1982, obtained a master's degree in materials science from Wuhan University of Technology in 1986, and completed his Ph.D. in Inorganic Chemistry from Monash University, Australia, in 1995. From 1996 to 2020, he worked in Cranfield University (UK) and since 2020 he has been working at BCMaterials in Leioa, Bizkaia. He has published 240 academic papers with a H-factor of 43 and served as the chief editor of one monograph: “Electrocaloric Materials - – New Generation of Coolers”. Professor Zhang has been honored with the Brian Mercer Award from the Royal Society in the United Kingdom in 2009.

Con la colaboración de:

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