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Crystalline phase development and stability in CeO_2-SiO_2 nanofibers derived from electrospun precursors[1] RACHEL DAY, ISAAC CROUCH, COURTNEY SEVERINO, ANDREI STANISHEVSKY, University of Alabama at Birmingham, Department of Physics, Birmingham, AL 35294-1170,USA
— Ceria (CeO_2) is a preferred catalytic material in applications found across many industries, including its use in water-gas shift reactions, automotive catalytic converters, and the removal of VOCs. Ceria nanofibers (NF) are attractive in such applications, but there are few reports on CeO_2-based NF fabrication, phase development, and performance. One major obstacle in the development of CeO_2 NF is their thermal stability and lack of sustainable production. It has been seen that CeO_2 NF frequently disintegrate at increased temperatures. In the present study, a high-yield synthesis of CeO_2 composite nanofibers with SiO_2 was attained using alternating force electrospinning. Analyses of CeO_2 NF crystallization process and resulting NF morphologies and structures were performed using TGA, FESEM/EDS, and XRD. CeO_2-SiO_2 NF with Ce:Si molar ratios from 1:4 to 4:1 were stable up to 1000 ^oC. They consisted of nanocrystalline CeO_2 and amorphous SiO_2, with no compound formation observed. Crystallization of SiO_2 and CeO_2 was noted at 1200C, accompanied by the significant shrinkage and loss of fibrous structure. The obtained results demonstrate the improved thermal stability of complex oxide nanocrystalline CeO_2-based nanofibrous ceramics.

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Rachel Day
University of Alabama at Birmingham, Department of Physics, Birmingham, AL 35294-1170,USA

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