

Synthesis and structural characterization of uranium-doped Ca_2CuO_3 , a one-dimensional quantum antiferromagnet

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Abstract: The technological settings of a modified sol-gel method for the preparation of highly fine homogeneous powder of Ca_2CuO_3 doped with uranium 238 ($x=0.0-0.05$) is presented. The analysis of structure, purity of phases and the justification for the role of uranium in the given compounds are provided, together with an almost complete classification of the observed optical phonons by means of Raman, IR measurements and ab initio calculations. A significant reduction in particle size was achieved by doping, and a strong correlation between resistivity and doping concentration was observed and explained using the phonon-assisted electron hopping conduction model. The persistence of a covalent insulation state in all compounds is an interesting feature of this doping. © 2008 Springer-Verlag.

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