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Dielectric constant of Al2O3 powder extracted from Iraqi Kaolin

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Samples of x%Al_2O_3 (x = 17.85, 28.05, 87.98 and 95.63) were prepared from Iraqi kaolin by the use of calcinations process and the method of evaporation. The temperature dependence of dielectric constant is studied for annealed powder samples of various Al_2O_3 contents in the frequency range 1 KHz – 1 MHz. The frequency dependent values of dielectric constant for the powder content 87.98% Al_2O_3 and 95.63% Al_2O_3 are found to be varies between 9.21 – 12.29 and 6.99 – 12.063, respectively. While for others percentages of 17.85% Al_2O_3 and 28.05% Al_2O_3 powder content samples are changes from 22.195 to 151 and from 13.015 to 21.09 respectively. The results are analyzed and discussed in details. The increase of annealing temperatures at 10 KHz for samples 17.85% Al_2O_3 to 95.63% Al_2O_3, reduce their dielectric constant. Such change found to be due to the result of materials structure transformation. For %Al_2O_3 samples, there is a strong dependence at high and low percentage while a lower dependence is found for intermediate containing samples.

Biography

Ayoub Sabir Karim is an Assistant Professor of Materials Science at Salahaddin University. He received his PhD degree in Materials Science from the University of Baghdad. He is leading a researcher on materials science group.

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Electronic and crystalline structure of Co- and Te-Substituted FeSe

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Herein we report the results from the study of the electronic and crystalline structure of Fe1- xCoxSe and FeSe1-xTex (x=0-1). For our analysis we used X-ray emission spectroscopy (XES), resonant inelastic X-ray scattering (RIXS), X-ray diffraction (XRD), and density functional theory (DFT). With these tools we determined the crystalline structure of our systems and probe the unoccupied levels (conduction band). The results indicate that under Fe substitution by Co, there is a solubility limit starting at x=0.38 where the hexagonal phase dominates the system. It is assumed that the structural transition suppresses superconductivity even for relatively low Co concentrations (x>0.15). In the case of Se substitution by Te, we confirmed that the tetragonal phase remains for all concentrations although the lattice parameters increase and the lattice distorts. These findings support the view that the tetragonal phase is indispensible for superconductivity in this system. Regarding the electronic properties of both systems, both calculations and measurements suggest that Fe behaves metallic and do not form strong bonds with Se, Co or Te suggesting that the system cannot be regarded as a strongly correlated. Finally, using RIXS, we found that the spin state of our systems fluctuates between S=0 and 2. This is important because the model suggests a correlation between the spin state and the magnetic order.

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