Room temperature dielectric properties of polycrystalline FeTe1−xSex (x = 0.0–0.5)

ABSTRACT

In this work, frequency-dependent dielectric properties of polycrystalline samples with nominal compositions FeTe1ī x Se x (x = 0.0ï 0.5) were investigated. The samples were synthesized via solid-state reaction method with intermittent grinding at ambient pressure. The phase formation, lattice properties and chemical compositions of the samples were analysed. Dielectric constants (ŮNjŮNj dielectric loss (tan ŭ) and alternating current (AC) conductivity (ů ac) as a function of frequency ranging from 100 Hz to 10 MHz were measured at room temperature. X-ray diffraction (XRD) data showed the presence of impurity phases of Fe3O4, FeTe2 and hexagonal FeSe/Fe7Se8. Both a and c lattice parameters decreased with the substitution of Se. Energy-dispersive x-ray spectroscopy confirmed the increasing ratio of Se/Te with x. The measured negative values of real dielectric constant (ŮNjfor x = 0.0ï 0.5 indicate the conductive nature of these samples. As the Se content was increased, the ŮNjecame more negative as a result of better grain connectivity as shown by the higher AC conductivity and dielectric loss.

Keyword: FeTe; Se substitution; X-ray diffraction; Dielectric properties