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Dielectric Characterization by Impedance Meter of Thin Films $Bi_2S_{3(0.6)}ZnS_{(0.4)}$ Composites

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ABSTRACT

An impedance in module and phase form of thin films $Bi_2S_{3(0.6)}ZnS_{(0.4)}$ composites was measured in terms of frequency and temperature using *HP4192* impedance meter. Semicircular arcs were obtained. These arcs were theoretically simulated to get the equivalent circuit parameters and to model the different processes taking place in the solid thin films. AC conductivity study expresses the behavior of disordered materials where transport occurs by hopping assisted by phonon between localized states near the Fermi level. The complex permittivity obtained from electrical measurements reflects losses and dissipation of energy in thin films , and it is attributed to the interfacial and dipolar polarization.

Table 1: The estimated relaxation time values; resistance "R" and capacity "C" obtained by the adjustment of the curves

	$\tau=1/2\pi f$ (n.sec)	**Rg** [Ω]	**Cg** [Farad]
T =20°c	212,314	2245421.08259	$1{,}0951.10^{-13}$
T =40°c	231,68	1372065.77403	$2{,}1253.10^{-13}$
T =60°c	397,39	838439,57249	$4{,}5417.10^{-12}$

Table 2: conductivity 'σ_{AC}' values taken at low frequencies, the exponent 'S' and the density of states at the Fermi level calculated for $Bi2S3_{(0.6)}ZnS_{(0.4)}$ thin film

T [°C]	**σ_{AC} [Ω.cm]$^{-1}$**	**S**	**$N(E_F)x10^{20}$ [$eV^{-1}.cm^{-3}$]**
20	0,02530	0,2033	0,4347
40	0,0358	0,11866	0,58412
60	0,05435	0,11665	1,3035

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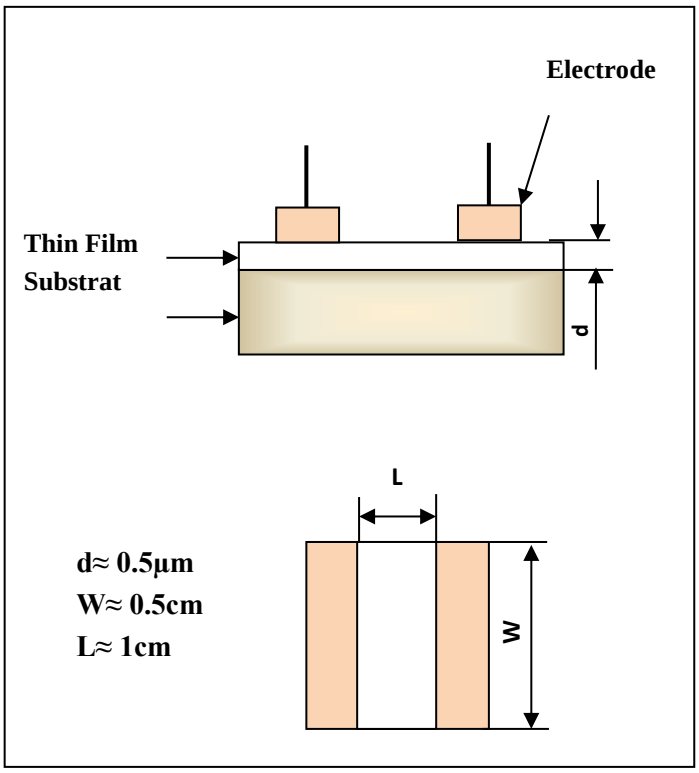

Fig 1: coplanar configuration of the sample

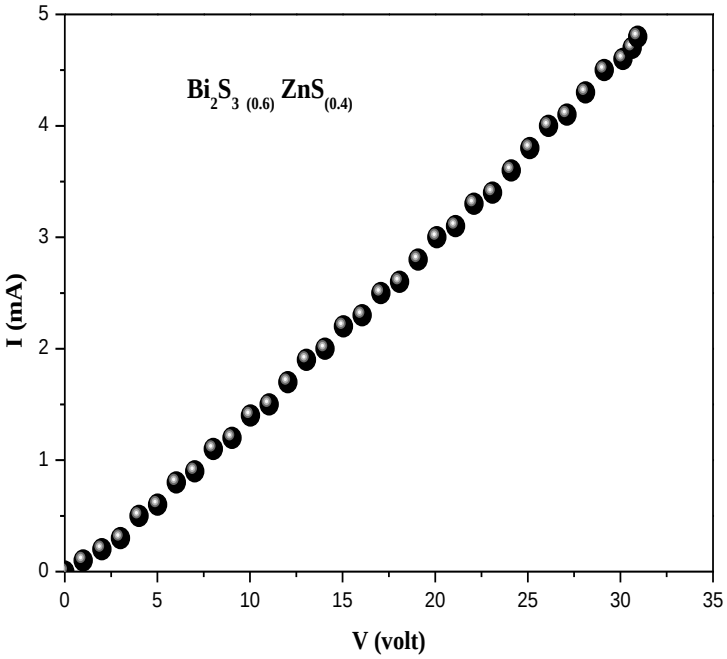

Fig 2: Characteristic I(V) of the sample

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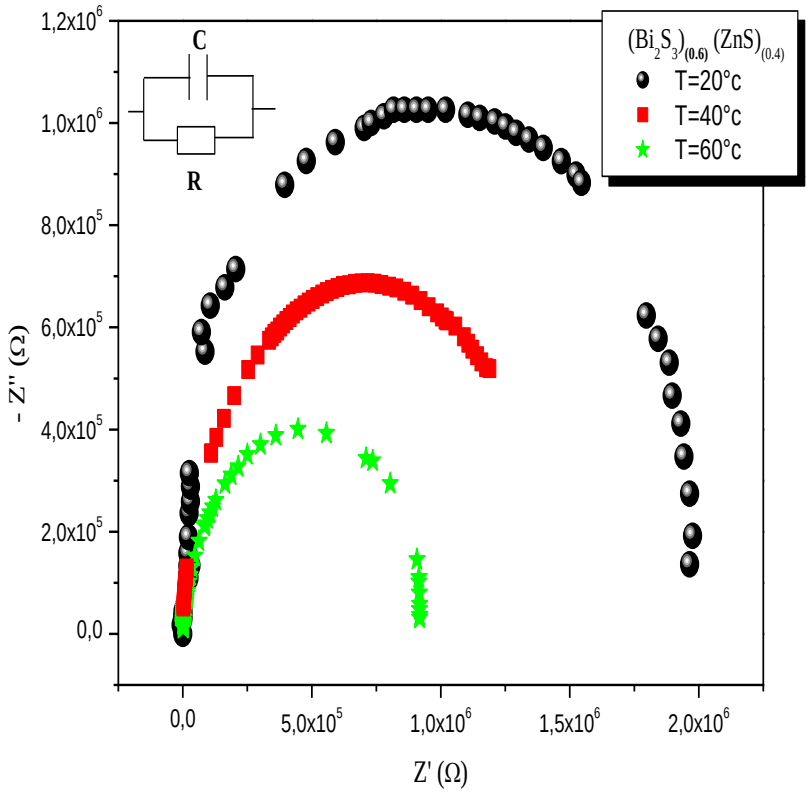

Fig.3: Impedance imaginary part. vs real part and equivalent electrical circuit top left.

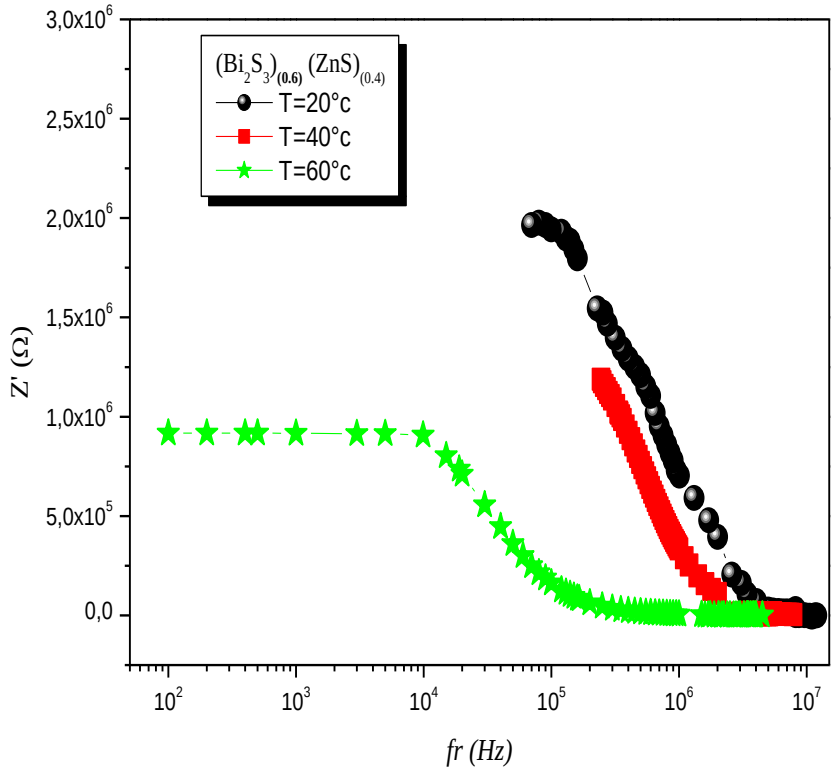

Fig 4: impedance real part Z' vs. frequency and temperature

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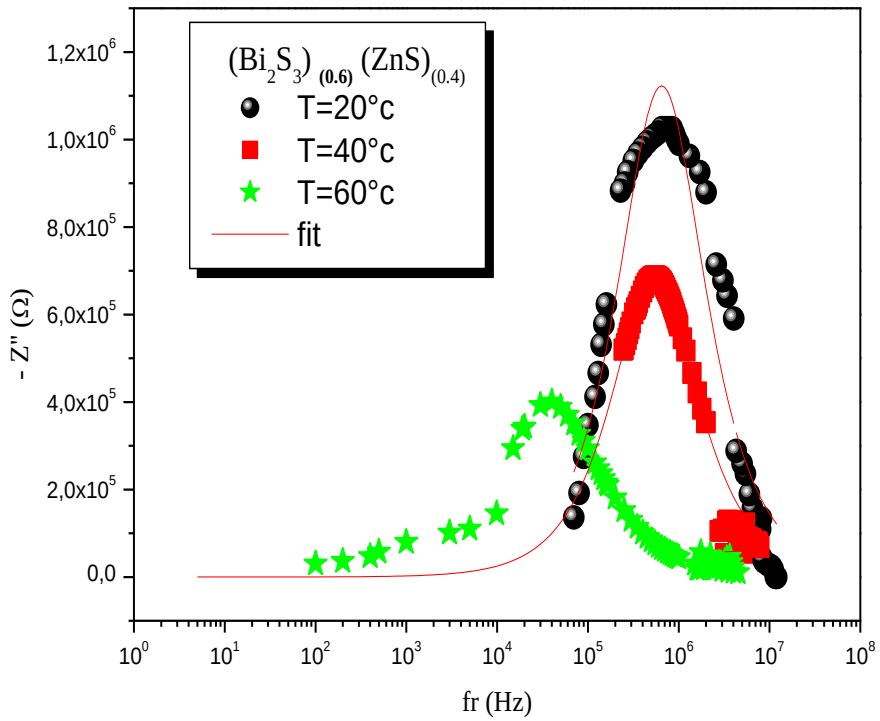

Fig 5: impedance imaginary part Z'' vs. frequency and temperature

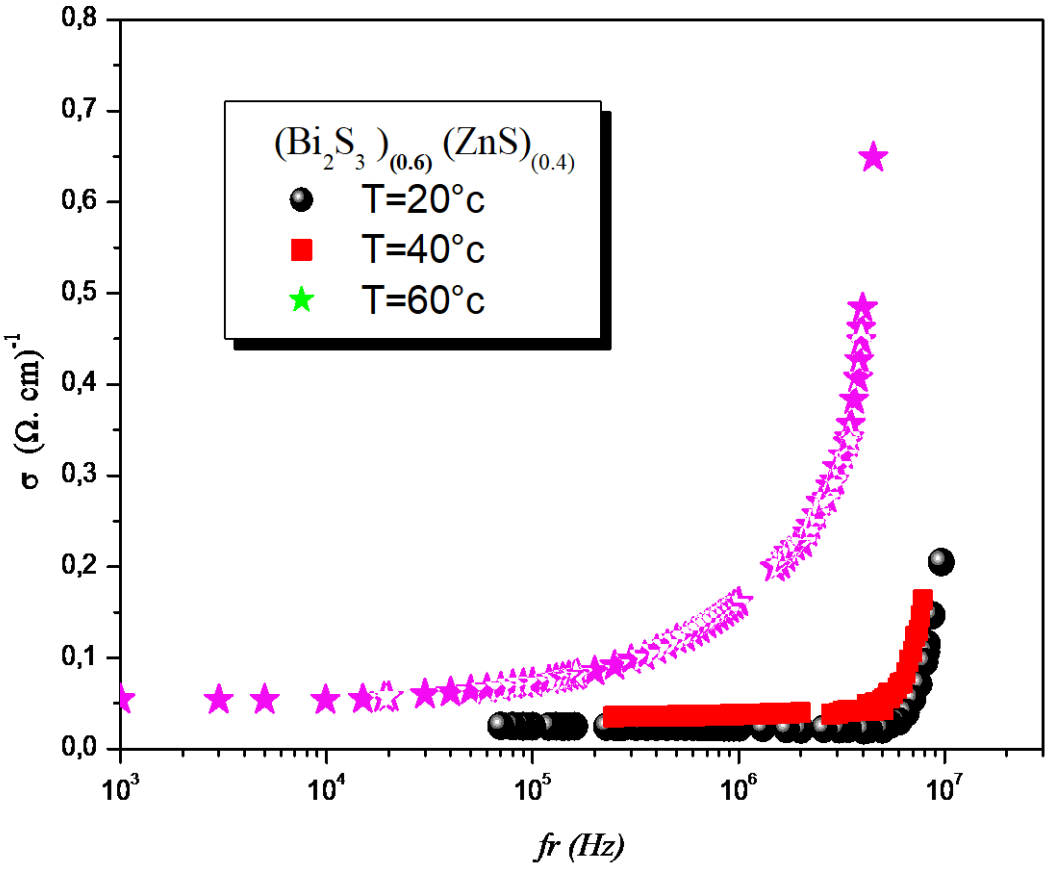

Fig.6: Electrical conductivity .vs frequency and temperature.

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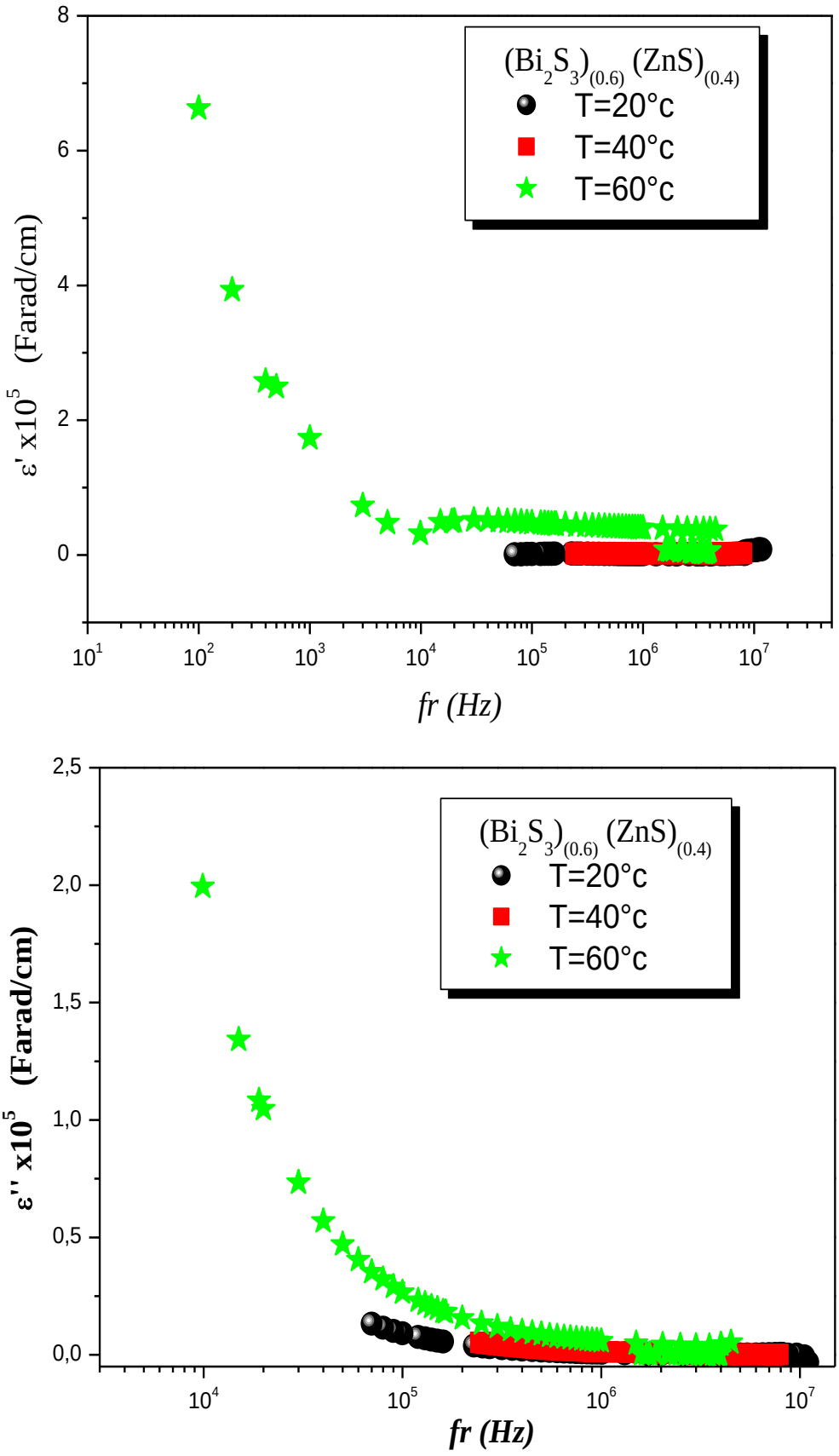

Fig 7: (ε') and (ε") variations vs. Frequency and temperature

Keywords: *Bi2S3, ZnS, thin-film composites, impedance meter, electric and dielectric properties.*

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