

Temperature Effect on Changing of Electrical Impedance and Permittivity of Ouargla (Algeria) Dunes Sand at Different Frequencies

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Abstract : The goal of this study is the estimation real and imaginary components of both electrical impedance and permittivity z' , z'' and ϵ' , ϵ'' respectively, in Ouargla dunes sand at different temperatures and different frequencies, with alternating current (AC) equal to 1 volt, using the impedance spectroscopy (IS). This method is simple and non-destructive. the results can frequently be correlated with a number of physical properties, dielectric properties and the impacts of the composition on the electrical conductivity of solids. The experimental results revealed that the real part of impedance is higher at higher temperature in the lower frequency region and gradually decreases with increasing frequency. As for the high frequencies, all the values of the real part of the impedance were positive. But at low frequency the values of the imaginary part were positive at all temperatures except for 1200 degrees which were negative. As for the medium frequencies, the reactance values were negative at temperatures 25, 400, 200 and 600 degrees, and then became positive at the rest of the temperatures. At high frequencies of the order of MHz, the values of the imaginary part of the electrical impedance were in contrast to what we recorded for the middle frequencies. The results showed that the electrical permittivity decreases with increasing frequency, at low frequency we recorded permittivity values of $10+11$, and at medium frequencies it was $10+07$, while at high frequencies it was $10+02$. The values of the real part of the electrical permittivity were taken large values at the temperatures of 200 and 600 degrees Celsius and at the lowest frequency, while the smallest value for the permittivity was recorded at the temperature of 400 degrees Celsius at the highest frequency. The results showed that there are large values of the imaginary part of the electrical permittivity at the lowest frequency and then it starts decreasing as the latter increases (the higher the frequency the lower the values of the imaginary part of the electrical permittivity). The character of electrical impedance variation indicated an opportunity to realize the polarization of Ouargla dunes sand and acquaintance if this compound consumes or produces energy. It's also possible to know the satisfactory of equivalent electric circuit, whether it's miles induction or capacitance.

Keywords : electrical impedance, electrical permittivity, temperature, impedance spectroscopy, dunes sand ouargla

Conference Title : ICMSE 2024 : International Conference on Materials Science and Engineering

Conference Location : Dubai, United Arab Emirates

Conference Dates : November 07-08, 2024