



ABSTRACTS: VOLUME 3, SPECIAL ISSUE

ABSTRACT

Electrical Conductivity of Dead Sea Water

Shahd Habbash, Dr. Maen Ishtaiwi , Dr. Muna Hajj Yahya..

Physics Department, Faculty of Science, An-Najah National University.

Published in May 2022

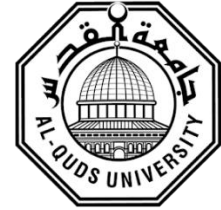
Introduction: The Dead Sea is a landlocked hypersaline lake located in the deepest part of the Dead Sea Jordan Rift Valley. Its huge benefits come from the high salinity rate; it has 345 grams of mineral per liter (34.5% or 34.5 g/100 mL). This salt concentration is about 7 to 10 times that of the oceans.

This fact about the Dead Sea Water makes it our concern in this research.

Background: The concentration of salts in water affects its microwave dielectric properties. Huge number of studies worked in NaCl solution with different concentrations and found their electrical properties.

In addition, a previous study showed that at frequencies between 3 and 10 GHz, there is a significant difference between the permittivity of natural seawater and an aqueous NaCl solution of the same salinity and, on the other hand, there is no significant difference between the permittivity of natural and synthetic seawater for frequencies greater than 3 GHz.

Objectives: Measuring the electrical conductivity σ of Dead Sea Water and comparing the values with that for distilled water.



Methods: 1- Vector Network Analyzer (VNA), 200 MHz-9 GHz.

2- Four-Probe method.

Results: The results of the VNA shows that for Dead Sea water, the significant increase in conductivity occurs at frequencies less than 2 GHz and then completes the increase slightly. On the other hand, the conductivity increases linearly in the whole frequency range for Distilled water. For both (Dead Sea water and Distilled water) reach close values of conductivity as the frequency increases.

From the calculated values of the conductivity by using the Four-Probe method, it is clear that the conductivity of Dead Sea water is 3-4 order of magnitude larger than that for distilled water.

Conclusions: the conductivity of Dead Sea water is much larger than the conductivity of distilled water according to the two used methods (VNA and Four-Probe). The large difference between them is caused by the high concentration of salts in the Dead Sea water (high salinity). This is expected by the fact of the direct proportionality between the number of free ions, which is large in the high salinity medium and the electrical conductivity of that medium.

Research Keywords: Electrical conductivity, Salinity, Vector Network Analyzer (VNA), Four-Probe.