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Optical and electrical properties of some skin of tomatoes, apple and peppers

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Abstract

Vegetable skins have many properties that can be used to produce new biodegradable materials. In this study, our work looks to take advantage of the bio-resources in the industry. This study reports the optical and electrical properties of fresh and dried skin of tomato, apple and pepper. The study was carried out in the frequency range between 100 Hz and 1 MHz, and temperature range from 300 K to 400 K.

Materials

Tomatoes, apple and pepper were obtained from the local market and maintained at room temperature (300 K) until their use. Subsequently, the outer skin was separated from the rest of the sample with a blade, then placed uniformly on a glass substrate. The samples are then used without any additional treatment.

Measurements

The optical transmittance measurements were performed using a Shimadzu UV-PC spectrophotometer in the range of 200 – 2800 nm. The electrical measurements were carried out using the impedance spectroscopy, in the frequency range from 100 Hz to 1 MHz, under isothermal conditions, for temperatures ranging between 300 and 360 K.

Results and discussion

Optical properties

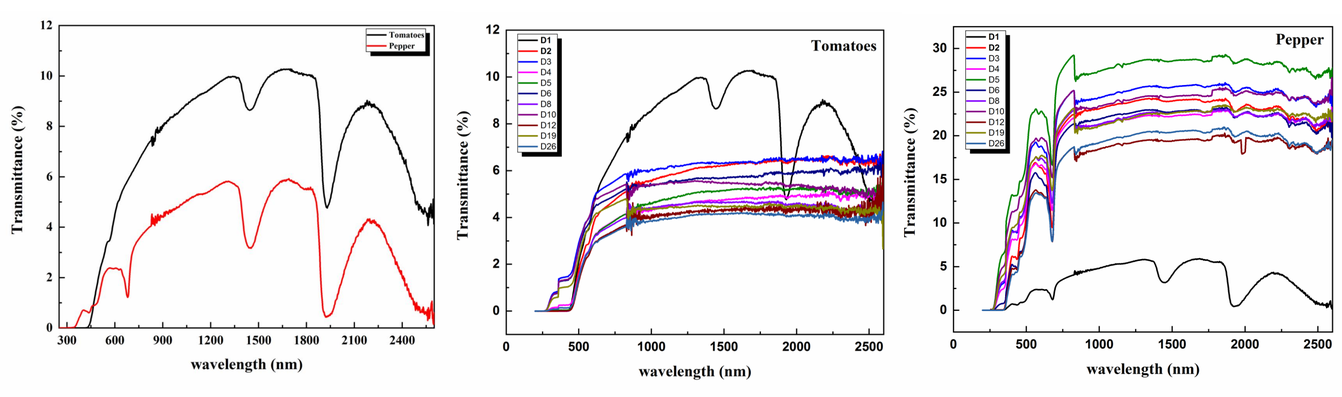

Figure1 :Transmission Spectrum of fresh and dried skins of tomatoes and pepper.

The UV-Visible spectrometry was used to define the optical properties of the fresh and dried samples (Figure 1). We found that our samples absorb in the same frequency. These peaks disappeared with time due to the removal of the molecule of water [1].
It was also noticed that the percentage of transmittance of samples is different from sample to other due to the transparency of the samples.

Electrical properties

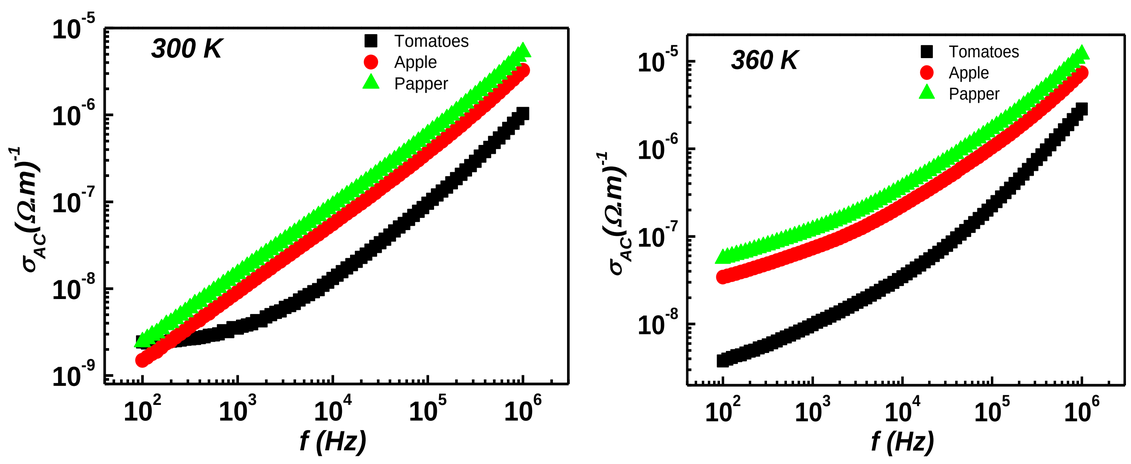

Figure 2 :Frequency-dependent of AC conductivity for the skins of tomatoes, apple and peppers, for temperatures between 300 and 360 K.

For each skin, the conductivity increases with the increase of temperature.

Dielectric properties

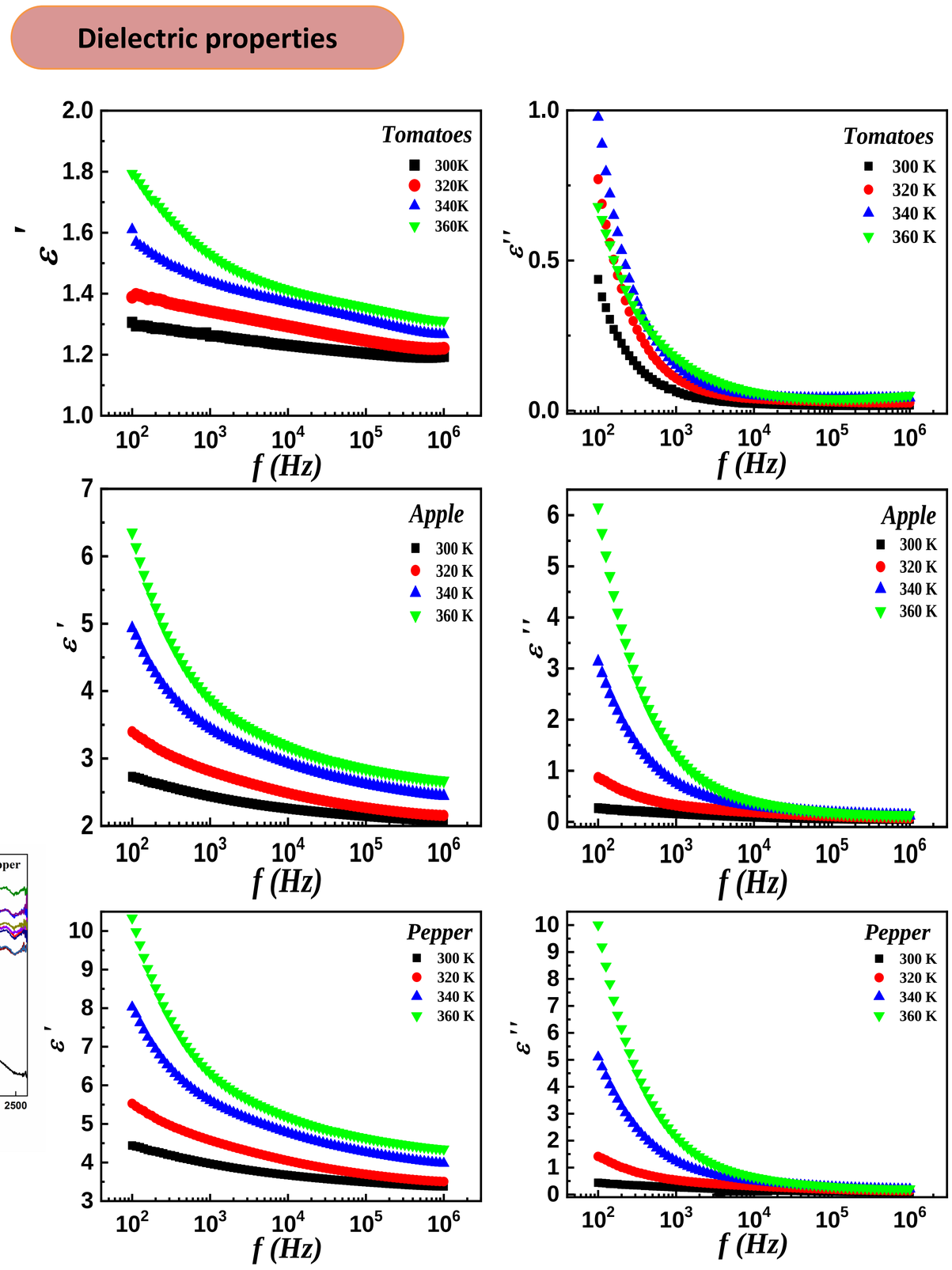

Figure 3 : the real and imaginary parts of dielectric permittivity as function of frequency for the skins of tomatoes, potatoes and peppers, for different temperatures

Figure 3 shows the real and imaginary parts of the dielectric permittivity of skins of tomato, apple and pepper over temperature and frequency.
The dielectric constant increases linearly with temperature, and at low-frequency increases about 6, from 300 K to 360 K.
The effect of temperature on the imaginary part has similar behaviour.

Conclusions

The studied skins have many useful properties in new manufacturing materials [2]. They absorb in the same absorption bands of the molecule of water, as they have the same chemical groups in infrared study.
The AC conductivity and the dielectric permittivity increase with temperature.
In the future work, we will study the electric modulus and the mechanical properties and the chemical composition of these membranes for their use in production of new low cost, biodegradable and ecofriendly materials.

References

[1] C. NACEUR ABOULOULA, A. OUERIAGLI, A. OUTZOUHIT, UV-VIS spectroscopic studies of some skin of tomatoes and peppers, Materials Research Proceedings 1 (2016) 291-293.
[2] http://triblive.com/business/headlines/6259292-74/heinz-based-ford.