

微波频率和温度对食用植物油介电特性的影响Effect of Frequency and Temperature on Microwave Dielectric Properties of Edible Vegetable

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摘要: 采用同轴探头技术研究了20~90℃、200~4500MHz内菜籽油、大豆油、花生油、玉米油、调和油的介电特性,分析了介电参数值随频率和温度变化的原因。结果表明:同频率下,菜籽油具有最大的相对介电常数和最小的介质损耗因数,而玉米油则相反。在500~4000MHz间,介电参数与食用油中的饱和与不饱和脂肪酸含量间具有较好的线性相关性。相对介电常数随温度升高线性减小,但介质损耗因数则线性增大。菜籽油的介电参数受温度影响变化最明显,而玉米油最不明显。随着频率或温度的增加,电磁能在食用油中的穿透深度减小。The dielectric properties of rap oil, soybean oil, peanut oil, corn oil and well-distributed oil were studied by the open-ended coaxial probe technology over the frequency range from 200 to 4500MHz and temperature from 20 to 90℃. The reasons why relative dielectric constant and dielectric loss factor changed with frequency and temperature were analyzed. The results indicate that the relative dielectric constant of rap oil was maximal and the dielectric loss factor of which was minimal among five oils at the same frequency. However, the corn oil had minimal relative dielectric constant and maximal dielectric loss factor. The good linear relationships between permittivity and saturated fatty acid and unsaturated fatty acid were found over the frequency from 500 to 4000MHz. The relative dielectric constant decreased linearly with increasing temperature, but the loss factor increased linearly. The permittivity of rap oil was affected obviously by the temperature, while the influence was very small to corn oil. The penetration depths of electromagnetic energy in edible oils decreased with the increase of frequency and temperature. This study was useful to understand the microwave dielectric properties of vegetable oils and to further study the effect of edible oil quality based on the dielectric property.

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