# Study of Deep Frying Oils Quality with the use of Microwave Spectroscopy

S. von Gratowski, M.Parchomenko, N. Fedoseev, R. Denisjuk. Institute of Radio Engineering and Electronics, Russian Academy of Sciences, Fryazino, Moscow region, 141190 Russia

Last time much attention was paid to study of quality of deep frying oils with the use of dielectric methods. Most of known methods for rapid testing of deep frying oils quality are based on dielectric changes. Dielectric permittivity is related to the level of polar components in frying oils. In general dielectric permittivity is a complex value and can be expressed as $\varepsilon=\varepsilon'+i\varepsilon''$. Here $\varepsilon'$ is a measure of polarization and are named dielectric constant and $\varepsilon''$ is the measure of losses, $i = \sqrt{-1}$. Currently most of dielectric tests are conducted at one very low or zero frequency. In this case dielectric permittivity is almost equals to dielectric constant and only changes in dielectric constant are taken into account in methods mentioned above. Measurements on different measurements high frequencies and taking losses into account give additional possibility for monitoring quality of deep frying oils. We use these possibilities for elaboration new methods for monitoring of Total Polar and Polymeric Materials in deep frying oils. For many polar substances and polymers the frequency dependences of $\varepsilon''$ have one or more maxima. Near such maxima the frequency dependences of $\varepsilon'$ and $\varepsilon''$ are the most definite. These frequency ranges are named “ranges of dispersion of dielectric relaxation”. Within such frequency ranges the sensitivity of microwave measurements to polar or polymer substances content is maximal. These features of dielectric relaxation will be used in this work for elaboration of new methods for monitoring of deep frying oils quality.

In first part of work influence of food materials on dielectric properties in microwave frequency range for deep frying oil during frying was studied. Sunflower oil was fried without any food and together with potatoes. In both cases measurements of dielectric properties in microwave frequency ranges and acid number were curried out. It was found out that dielectric properties in both cases have only small difference. In second part of the work the correlation between changes in microwave dielectric losses and polymers materials content are studied.