

## Screening of Repeatedly Heated Cooking Oil Using Physico-Chemical and Electrical Properties with GC-MS Analysis for Reckoning its Reusability

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### Abstract:

Consuming repeatedly heated cooking oil can have chronic effects on humans. To estimate the reusability of oil samples that underwent multiple cycles of reheating under different conditions, several factors—dielectric constant, viscosity, ultrasonic velocity, and peroxide value (PV) — were investigated. Saturated fatty acids (SFAs) and unsaturated fatty acids (UFAs) in the collected oil samples were identified by Gas Chromatography-Mass Spectrometry (GC-MS). Empirical equations were developed correlating dielectric constant, viscosity and ultrasonic velocity with UFA and SFA. The dependency factor ( $R^2$ ) among the considered parameters ranges from 0.925 to 0.986. A non-destructive inspection study using ultrasonic velocity and intermolecular free length was conducted to estimate the quality of the samples. The Onsager molecular model equation for liquids was used to relate the microscopic factor, the electric dipole moment, to the macroscopic factor, the dielectric constant, to index the polarisation and dilapidation levels of the samples. The efficacy for estimating oil reusability based on specific physical factors classify oil quality and its reusability.

### Keywords:

Dielectric constant; dipole moment; GC- MS; heated oil, ultrasonic velocity.