



Analysis of Edible Oils using the Teledyne Leeman Labs Prodigy High Dispersion ICP

Introduction

Edible oils are derived from a wide variety of plants and plant seeds and are used in many aspects of domestic and world-wide food production. Once the oil has been extracted from a plant seed, it is refined as needed for use in foods such as salad dressings, margarine, shortenings, snack foods and frying oil.

Oils contain unsaturated fatty acids and relatively high levels of phospholipids which can react with oxygen to produce unpleasant flavors and odors in the oil. The presence of trace concentrations of metals such as Ca, Cu, Fe, Mg and Ni promote oxidation and can significantly reduce the shelf life of an edible oil. To increase their chemical stability and resistance to oxidation, oils are often partially or fully hydrogenated. Oils are also hydrogenated to increase their melting point, making them suitable for use with fried foods or baked goods and pastries.

Hydrogenation is a chemical process in which hydrogen gas reacts with oil at high temperatures and pressures to convert unsaturated fatty acids to saturated ones. This process alters the physical and chemical properties of the oil, including its texture and melting point. In general, as the oil becomes more saturated, it becomes more solid and more shelf-stable.

Hydrogenation requires the use of a metal catalyst. Platinum group metals such as Pt, Pd, Rh and Ru are sometimes used to catalyze hydrogenation reactions. These metals are highly active and react at relatively low temperatures and H_2 gas pressures. Non-precious metals such as Ni are commonly used as economical alternatives to precious metals; however, these catalysts require higher temperatures and pressures for reaction. Regardless of the catalyst used, it is necessary to remove all traces of the metal from the final product to avoid reversing the hydrogenation process and reducing the shelf life of the oil.

