METAL CONTENT DETERMINATION IN BIODIESEL SAMPLES BY MICROWAVE MINERALIZATION AND ICP-AES

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Biodiesel is a biodegradable, renewable, eco-friendly and non-toxic alternative to diesel fuel, which is produced by the transesterification of vegetable oils or animal fats with an alcohol and often employing alcoholic solutions of NaOH or KOH as a catalyst. This reaction produces alkyl esters from long chain fatty acids and glycerin, as a subproduct. Biodiesel contributes to the reduction of greenhouse gases and other harmful emissions, and produces quite less sulfur dioxide and about 60% less net carbon dioxide emissions than petroleum-based diesel. Furthermore, it reduces black smoke normally associated with diesel engine vehicles and other particulate matter emissions that cause respiratory tract damage[1].

The presence of metallic elements in fuels is usually undesirable, even at low concentrations, since they can promote the decomposition of fuel or corrosion of motor parts. Metal content determination in biodiesel is needed to assess both its performance in ignition engines and the atmospheric pollution associated with biodiesel combustion processes[2]. Furthermore, the metals and other elements presence in biodiesel can affect its stability, since they can accelerate oxidation processes. Therefore, the assessment of metals content in biodiesel is important in order to guarantee its final quality[3]. Metals and other elements present in biodiesel can come from raw materials used in its production, through absorption processes of soil pollutants where plants (olive, sunflower, corn, rapeseed, etc.) have grown, or being introduced during transport and storage of biodiesel[4].

The aim of the present work was focused on the optimization of a digestion method of biodiesel samples obtained by homogeneous catalysis from different types of vegetable oils, using a microwave oven, in order to carry out the determination of the content of Al, As, Ba, Ca, Cd, Co, Cr, Cu, Fe, K, Mg, Mn, Mo, Na, Ni, P, Pb, S, V and Zn in these samples by Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES). In the same way, these same elements were determined in the source oils, comparing the contents found both in the raw materials used and in the main product of the transesterification reaction.

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