Influence of the properties, collection, and storage of waste cooking oils on the biodiesel production

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In recent years, the global demand and consumption of vegetable oils have surged, with a varied distribution in terms of oil origin, quantity, and usage worldwide. Deep-frying, a widely employed cooking method, produces a desirable crunchy texture, taste, and flavor in foods. However, the breakdown of frying oils at elevated temperatures affects the quality of fried products and may pose health risks. Consequently, after several frying cycles, these oils become waste that must be disposed of properly to prevent environmental harm. To address the negative effects of improper disposal, Waste Cooking Oils (WCOs) can be transformed into various derivatives. Presently, WCO_S are mostly collected and converted into biodiesel and hydrotreated vegetable oil. The collection of WCOs has increased in recent years, driven by a growing societal awareness of environmental issues, since the improper disposal of WCOs can lead to significant environmental damage. WCOs have the potential to serve as secondary raw materials for environmentally friendly biodiesel production, which helps reduce pollution, promotes renewable energy use, and minimizes waste. However, the presence of various degradation products necessitates different pre-treatments before conversion, significantly impacting the economic feasibility of the process. Moreover, even pre-treated WCOs might possess physical and chemical properties that do not ensure the production of high-quality biodiesel. Therefore, understanding the degradation reactions that occur during oil frying and subsequent storage is crucial. Only WCOs that meet specific criteria will be suitable for high-quality biodiesel production. A collection and storage method tailored for biodiesel production is essential. Currently, the collection method does not incorporate any special protocols, storage containers, or temperature controls. Proper collection and storage of WCOs are advisable to minimize degradation and ensure the quality of WCOs before converting them into biodiesel. Any business generating WCOS should be equipped with specialized, food-grade storage units made of stainless steel or plastic, designed to facilitate the collection of used cooking oil and be ready for scheduled pick-up. While managing household WCO disposal may seem more challenging, simple steps such as preliminary filtration and using appropriate containers can help minimize unwanted reactions with air, light, and moisture, coupled with more regular collections by waste disposal companies. As a case study, the degradation of WCO from the university cafeteria in different containers under various temperature and light conditions was investigated experimentally for several months by the analysis of color, acidity, peroxide value and p-anisidine.

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