

Complete Utilization of Coffee Grounds

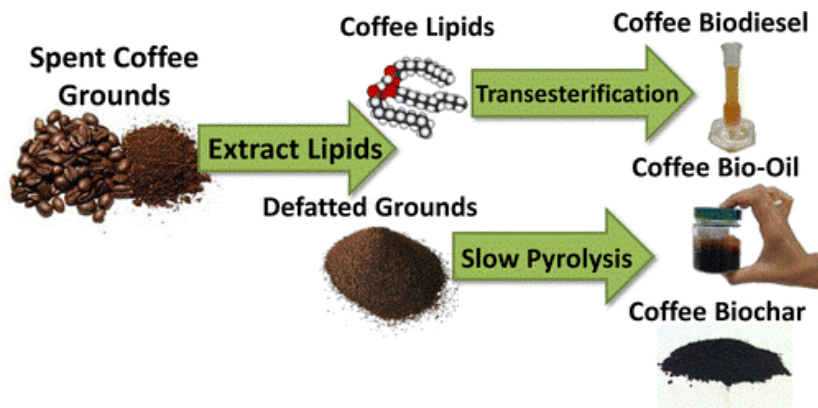
A 2011 **Huffington Post** article on popular American beverages stated that the average American coffee drinker consumes 18.5 gallons of coffee per year. If we conservatively assume that one quarter of the American population drinks coffee regularly, that would be about 80 million people drinking a total of 1.5 billion gallons of coffee per year. All that coffee produces about **650 million pounds** of spent coffee grounds which usually end up in landfills. But what if we could do something different with those spent coffee grounds, especially with commercially produced coffee? ISTC's Drs. Wei Zheng, Kishore Rajagopalan, and B.K. Sharma along with other colleagues from the University of Illinois and the United States Department of Agriculture found a way to use every part of the spent coffee grounds.

In their study, they produced biodiesel, bio-oil, and biochar from the spent grounds. Lipids extracted from spent grounds were converted to biodiesel. The pure biodiesel fuel properties did not meet ASTM and EN standard because the fuel displayed high viscosity, moisture, sulfur, and poor oxidative stability. However, the biodiesel blend (B5 and B20) met ASTM blend specifications.

Once lipids are extracted from the spent coffee grounds, they are considered defatted. The defatted spent coffee grounds then underwent slow pyrolysis to generate bio-oil and biochar as valuable co-products. The effect of feedstock defatting was assessed and resulted in reduced pyrolysis bio-oil yields, energy density, and aliphatic functionality, while increasing the number of low-boiling oxygenates. The bio-oil produced from the defatted spent coffee grounds will likely require upgrading and further refining due to the high bio-oil heteroatom (non-carbon and non-hydrogen elements) content.

Additionally, biochar derived from spent and defatted grounds were analyzed for their physicochemical properties. More about the biochar portion of this research can be read in the **biochar soil amendment** section.

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