One-pot green upgrade of refinery gasoline

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Ether oxygenates (MTBE, ETBE, TAME), known as gasoline ether oxygenates (GEOs) or fuel-ethers, are added to certain gasoline (petrol) formulations to improve combustion efficiency and to increase the octane rating. The production capacity of TAME in Greece is approximately 128,000 tpa, while the European production capacity in TAME for 2011 was ca. 586,000 tonnes. However, it is worthy of remark that the GEOs replaced TEL (Tetra-Ethyl Lead) as suitable octane boosters in the refinery blended gasoline pool and not as environmentally benign compounds. Unfortunately, GEOs contaminate soil and underground water [1]. This forced EU and US to set threshold values for GEOs in drinking water. An environmentally benign one-pot synthesis of an upgraded fuel that could replace the harmful GEOs from the refinery blended gasoline pool is being investigated. The proposed environmentally benign process offer an upgraded fuel not by putting additives, as usually, but by in situ high conversion of an existing low quality feedstock to strong anti-knocking ingredients of gasoline. An integrated application of heterogenised homogeneous catalysis in aqueous media takes place in the current one-pot fuel upgrade process. The ultimate product (fuel) reveals a more than 10 degree RON increase and the proposed industrial process reaches a 40% utilization in the 95 RON gasoline blending.

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[1] Bonventre et al., Aquatic Toxicology 120–121 (2012) 45-53.