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Speciation study of bioethanol from dates (HPLC-ICP-MS) linked to molecular sieve and sodium borohydride treatment

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The prospect of producing bioethanol from biomass available locally is in the interest of widespread sustainable growth and development. The novelty of our study focused on maximizing the recovery and purity of bioethanol from dates by subjecting the process to specialized treatment for removal of water and toxic species. Bioethanol production from dates of the Fard and Khalas cultivars is relatively unexplored, and was achieved by adopting standard protocol of thermal sugar extraction followed by fermentation and distillation. Water de-contamination of the product utilizing molecular sieve treatment led to enhanced purity of bioethanol (98%). Co-treatment with sodium borohydride resulted in reduced levels of toxic species Cr^{3+} , Cr^{6+} and As^{3+} by about 20%. The speciation study was conducted using hybrid liquid chromatography/mass spectrometry (HPLC-ICP-MS). A built-in dynamic reaction cell facilitated detection of the species of interest. Elemental profiling of bioethanol samples employing standard ICP-MS demonstrated that the levels of trace elements were higher in general for the Fard dates. Our research is significant from the perspective of deploying surplus dates for biofuel production to obviate competition for arable land. The study could make a useful contribution to ongoing research associated with climate change.

Biography

Dr. Mirella Elkadi is an Associate Professor in the Department of Chemistry at the Petroleum Institute. She is experienced in essential instrumental techniques including NMR, GC, IR and mass spectroscopy. Her recent interests are biofuels and alternative sources of energy.

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