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Potential of producing carbon black from waste tires

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The disposal of used tires generated each year into the environment is unacceptable, in Zimbabwe alone, which was the basis of this study; approximately 2.4 million tires are disposed each year. A better solution from an environmental and economic stand point is to thermally reprocess the tires into valuable products like carbon black which is required. This study focused on the feasibility study on the pyrolysis of waste tires to give carbon black, pyrolytic oil, steel and syngas as waste products. The waste tires were first shredded followed by the removal of metals. Shredded tires were pyrolysed at 450-500°C for 2 hours. Carbon black with a yield of 40% was achieved as well as some oils and volatile gases. The carbon black obtained can be activated and used for various purposes like filling in tiers and other rubber products.

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Development of novel catalytic materials for production of renewable transportation fuels from carbon dioxide

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Carbon dioxide hydrogenation (CDH) is a viable catalytic process that converts the greenhouse gas and hydrogen potentially produced from water into eco-friendly renewable chemicals and fuels. Production of hydrocarbons from CO_2 requires a polyfunctional iron-based catalyst enabling a tandem reaction where reverse water gas shift (RWGS) producing CO is followed by Fischer-Tropsch synthesis (FTS). The most efficient combination of these catalytic functions is achieved when the working catalytic material is produced by reductive carburization of a Fe-oxide matrix: Crystalline multimetal compounds-precursors where iron ions are uniformly distributed in the crystals bulk. This yields after activation and self-oprganization at process conditions a two(multi)-phase system where residual oxide phase(s) is responsible for catalysis of RWGS and Fe-carbide phase(s) – for FTS. Systematic study of a series of Fe-oxide matrices revealed that most efficient catalytic materials may be obtained from Fe-Al-O spinel and Fe-Ba-Hexaaluminate precursors yielding nanocomposites with higly balanced RWGS/FTS functioins. These matrices should be promoted with additives like K, Zr, Mn, Ti which action is critical for achieving high selectivity to C_5+ hydrocarbons. Recently in the Blechner Center at BGU was developed a CDH process conducted on a novel Fe-Al spinel catalyst in three packed-bed reactors in series with interim removal of water and higher hydrocarbons. The CO_2 conversion reached 89% and the C_5+ productivity was >0.5 g/g cat*h. This novel catalyst and process were tested for >1500 h demonstrating high catalysts stability. The C_5+ liquid produced in this process was used as a feedstock for preparation of high quality blending stock for transportation fuels.

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