Comparison of supercritical water gasification of acetic acid, acetaldehyde, and acetonitrile

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SCWG is a promising technology due to its ability to produce clean hydrogen-rich gas from a wide range of organic wastewater without drying procedure. An extensive research has been carried out on the SCWG treatment of real organic wastewaters and model compounds in water. Major compounds such as glucose, organic acids, valine, and glycerol are known to produce smaller compounds as intermediates in supercritical water. In this work, SCWG of acetic acid, acetaldehyde, and acetonitrile as potential intermediates was conducted to understand the gasification pathways of the simplest organic compounds in supercritical water. A continuous-flow reactor packed with Ni-Y/activated charcoal was used in all the experiments. Gas yields, gasification efficiencies, gas compositions, and COD destructions were measured to compare the gasification characteristics of those reactants. Reaction temperature (500-650 °C) and LHSV (21-65 h^{-1}) were investigated as major parameters. Acetonitrile was the most refractory compound to be gasified with carbon gasification efficiency less than 15 wt% at 650 °C and 28 MPa, followed by acetaldehyde and acetic acid.