Influence of organic solvents and acid catalysts on decomposition of microcrystalline cellulose

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Thermal decomposition of microcrystalline cellulose was studied in sub/supercritical solvents (as: m-xylene, dodecane, 1,4-dioxane, methanol and mixture of m-xylene/methanol). The effects of hydrogen and surface modified silica gel and magnetite particles by acid groups on conversion ratio have been investigated using high pressure and temperature reactor. The liquid products were analyses by GC with Mass or FID detector and the solid residue were balanced and characterized by XRD and TGA. Reaction temperature conditions were varied over range of 573-673K and initial pressure of hydrogen was 35 bars. Addition of H2 at 623K increased conversion ration about 4-7% in all solvents except in dodecane. 1.4-Dioxane showed the best conversion ratio at lowest temperature while further increase of temperature significantly decreased conversion. In polar protic solvent, the addition of surface acid catalyst led to drastically increasing conversion ratio (29%) of cellulose at 570K. However, it didn't increase conversion ratio in aprotic solvents. Use of methanol/m-xylene mixtures contributed to decreasing the reaction pressure condition at the condition of high conversion ratio.