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論文審査の要旨及び審査員

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論文審査の要旨（2000 字程度）

This thesis consists of a general introduction, four chapters including experimental methods, results, discussion of a novel process and overall conclusion consisting of 138 pages.
Thesis title: Dissolution Process Model of Rice Straw Particles in 1-Ethyl-3-Methyl- imidazolium Acetate at Elevated Temperatures

“Introduction: Overall Introduction to Lignocellulosic Biomass Pretreatment,” provides a basic overview of issues related to biomass pretreatment engineering which is the initial process for treatment or conversion of biomass in order to utilize it for chemical feedstocks and fuels. Existing technologies have merit and demerit. The objective of this study was to use an ionic liquid to dissolve Japanese milled rice straw.

“Chapter 1: Literature Review - Lignocellulosic biomass dissolution in Ionic Liquid,” gives a broad review of published papers in the field of biomass dissolution, ionic liquid properties, problems in the field and also the merit for using ionic liquids specifically, 1-Ethyl-3-Methyl- imidazolium Acetate for biomass dissolution process modeling.

“Chapter 2: Rice straw sample preparation and characterization,” presented resulted on pre-treatment processing of the rice straw by ball-milling an d materials characterization of the resulting powder which was on the order of 75-100 μm in diameter. Ball-milling temperature at 60^{o}C significantly reduced the rice particle crystallinity whereas milling at liquid nitrogen temperature preserved the crystallinity. Higher milling temperature enhanced the amorphization of the milled powder.

“Chapter 3: Dissolution Model of Ball-Milled Rice Straw Particles in
1- Ethyl-3-Methylimidazolium Acetate at Elevated Temperature,” presented and discussed results on the dissolution of the rice straw powder. Two different numerics ratios were presented in order to measure the dissolution rate of the rice straw powder when treated at 120^{o}C-160^{o}C in the ionic liquid solution versus heating time.

“Chapter 4: Optical and Confocal Microscopic Studies on Dissolution of Rice Straw Particle in 1-Ethyl-3-methylimidazolium Acetate,” presents results conducted at temperatures of 120^{o}C-160^{o}C where dissolution was accelerated at higher temperatures. The results were fitted by linear regression and showed a high correlation coefficient indicating the overall dissolution process was linear.

“Overall Conclusions,” summaries the research results and dissolution process model of rice straw in 1-Ethyl-3-Methyl imidazolium Acetate at elevated temperature. Both milling temperature and the ionic liquid heating temperature significantly influenced the dissolution rate of the particles and also impacted the particle morphology during the dissolution. Further research work follows the conclusions and proposes to validate the dissolution process model on other types of biomass.