Aalto University
School of Chemical Engineering

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Defence announcement

Public Defence on 20 October 2023

Title of the doctoral thesis	Phase equilibria of pyrolysis oil components and distillation of pyrolysis oil containing styrene
Content of the doctoral thesis	The first part of the thesis aims to investigate the **phase equilibrium behavior of bio-oil/polystyrene pyrolysis oil components** and their mixtures for the design of separation process. The mixtures that are challenging to measure due to complex phase behavior or lack thermodynamic data were chosen for the measurements. In this study, the binary system of phenol + dodecane showed azeotropic behavior. This research also revealed the two-liquid and three-liquid phase behavior of water + phenol + dodecane/hexadecane systems. The investigated binary system of styrene + toluene/alpha-methylstyrene showed ideal vapor-liquid behavior. The second part of the thesis focuses on the **purification of polystyrene pyrolysis oil** to polymerization grade styrene monomer applying batch distillation. The pyrolysis of polystyrene was performed at VTT Technical Research Center of Finland Ltd. From the batch distillation, styrene monomer was obtained with the purity of 99.94 wt.%. The polymerization tests showed that this grade of styrene monomer was suitable for further polymerization and subsequent production of synthetic latex or other polymers. The experimental distillation and the proposed continuous distillation model showed a possibility of scale-up of the process where styrene monomer can be obtained with a high purity.
Field of the doctoral thesis	Chemical Engineering
Doctoral candidate and contact information	M.Sc. (Tech.) Roshi Dahal email: nanidahal7@gmail.com
Public defence date and time	20 October 2023 at 12 o'clock (in Finnish time)
Remote defence	https://aalto.zoom.us/j/69610222063
Place of public defence	Aalto University School of Chemical Engineering, Lecture hall Ke2 (Komppa-Sali), Kemistintie 1, (main door at Biologinkuja) Espoo
Opponent(s)	Professor Boelo Schuur, University of Twente, the Netherlands
Custos	Professor Ville Alopaeus, Aalto University School of Chemical Engineering
Link to electronic thesis	https://aaltodoc.aalto.fi/handle/123456789/51
Keywords	phenol; hydrocarbons; two-liquid phases; three-liquid phases; spline fit; decanter model; polystyrene pyrolysis oil; ideal system; batch distillation; short-path distillation; styrene monomer