

79c A Five-Zone Simulated Moving Bed for Isolation of Six Sugars from Biomass Hydrolyzate

Yi Xie, Chim Y. Chin, Diana Santiago Campos Phelps, Chong Ho Lee, Ki Bong Lee, Sungyong Mun, and Linda Wang

A five-zone Simulated Moving Bed (SMB) process was developed to recover sugars from corn-stover hydrolyzate. The sugars can serve as fermentation feedstock for ethanol production. The major hydrolyzate components are six sugars and four impurities (sulfuric acid, acetic acid, hydroxymethyl furfural, and furfural). An eight-zone SMB based on Dowex99 and a five-zone non-isocratic SMB based on poly-4-vinyl pyridine (PVP) were designed with pseudo-linear Standing Wave Design, and optimized. Cost analysis and fermentation tests indicated that the PVP SMB is most cost effective. The design was tested using VERSE simulations and SMB experiments. Two different feed compositions, two different feed flow rates, and two different regenerants were tested in three PVP SMB experimental runs. All runs had 99+% yields. The sugars purities ranged from 93 to 95% because some sulfate and acetate co-eluted with the sugars. Discounting the salts results in >99% purities. This study shows the model-based-design approach can achieve high yield and high purity for multi-component separation in five-zone non-isocratic SMB.