Electronic Supplementary Material (ESI) for Green Chemistry.
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Figure S1. Trends of upgraded vapors during pyrolysis of 40 boats of pine and the vapors passed through 0.5 g fixed bed of \( \beta \)-zeolite (SAR 25).

Figure S2. Trends of upgraded products, intermediates and primary vapors during pyrolysis of 40 boats of pine and the vapors passed through a fixed bed of 0.5 g \( \beta \)-zeolite (SAR 25).

Figure S3. Averaged mass spectra for pyrolysis and upgrading of pine vapors recorded from boat 1 (\( \beta \)-zeolite with SAR 250).

Figure S4. Multivariate analysis of a deactivation study of SAR 21 \( \beta \)-zeolite during upgrading of pine pyrolysis vapors. The top plot shows the component scores as a function of biomass-to-catalyst ratio. The reconstructed spectra for each pure component (PC 1 to PC 3) are shown in the lower plot.
Figure S5. Multivariate analysis of a deactivation study of SAR 38 β-zeolite during upgrading of pine pyrolysis vapors. The top plot shows the component scores as a function of biomass-to-catalyst ratio. The reconstructed spectra for each pure component (PC 1 to PC 3) are shown in the lower plot.

Figure S6. Multivariate analysis of a deactivation study of SAR 75 β-zeolite during upgrading of pine pyrolysis vapors. The top plot shows the component scores as a function of biomass-to-catalyst ratio. The reconstructed spectra for each pure component (PC 1 to PC 3) are shown in the lower plot.

Figure S7. Multivariate analysis of a deactivation study of HZSM-5 during upgrading of pine pyrolysis vapors.
vapors. The plot shows the component scores as a function of biomass-to-catalyst ratio.