The expanded production of shale gas has increased the desire for developing methods for converting light alkanes, especially propane and ethane, into aromatics (i.e., benzene, toluene, and xylene) and gasoline, especially for stranded gas. One option is a multi-step process for conversion of light alkanes to aromatics, where the first stage converts light alkanes into olefins and hydrogen, and the second stage converts olefins to aromatics. However, to determine the viability of this process, a better understanding of the performance of olefin aromatization is necessary.

Previous studies on the conversion of olefins to aromatics with ZSM-5 and Ga or Zn bifunctional ZSM-5 catalysts have concluded that benzene, toluene, and xylenes (BTX) yields are significantly higher for the latter. In this study, a highly active, bifunctional PtZn alloy with H-ZSM-5 catalyst is investigated for propene aromatization. At low to moderate propene conversions, in addition to BTX, light alkanes and olefins are produced. The latter may also be converted to aromatics at higher propene conversion, while the former are not. When compared at equivalent propylene conversion, the bifunctional catalyst has a much higher selectivity to aromatics than ZSM-5 consistent with the previous literature. However, when compared at equivalent conversion of all reactive intermediates, the bifunctional catalyst exhibits very similar BTX selectivity.

Additionally, previous studies have investigated the H-ZSM-5 and Ga/H-ZSM-5 in the absence of H_2; however, for a two-step process for conversion of alkanes to aromatics, it would be desirable to utilize a catalyst which could convert olefin and H_2 to aromatics. Herein, H-ZSM-5 and Ga modified H-ZSM-5 are compared for propylene aromatization in the presence and absence of equimolar hydrogen. At low pressure, the presence of H_2 has no impact on the product distribution of either catalyst. At higher pressure, H_2 also does not alter the product distribution of H-ZSM-5 or Ga/H-ZSM-5 at conversions $<80\%$. However, for the latter, at higher H_2 pressure hydrogenation of C_4 olefins give higher yields of butanes and lower slightly lower aromatic yields.

Results from these studies provide valuable insight into the development of a process for converting light alkanes (i.e., ethane, propane, and butane) into aromatics and high-octane gasoline. These results can be used to develop an optimized process design and economic model for the conversion of olefins to aromatics and/or gasoline.