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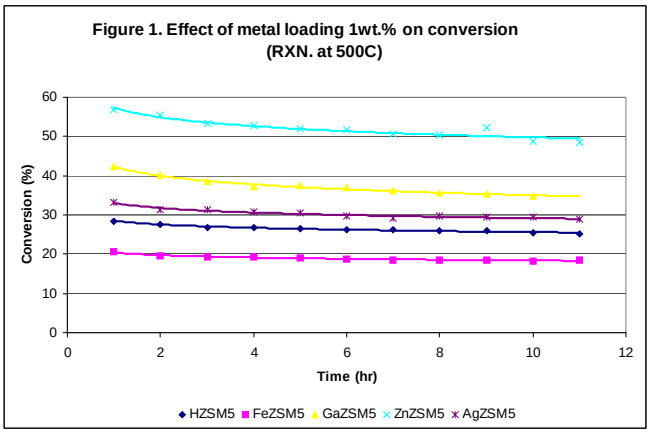
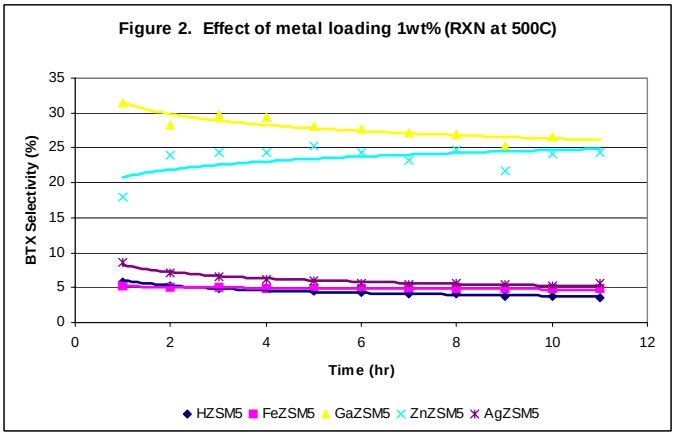
C_5 Hydrocarbon Conversion to Light Olefins and Aromatics on Metal Modified ZSM-5 Zeolite Catalyst

Reaction of cyclopentane on ZSM-5 zeolite were studied at 500°C. The products of reaction were analyzed and classified into 3 groups, i.e. LPG (butane, betene, propane, propene), aromatics (benzene, toluene, xylene) and C_9+. In general, HZSM-5 revealed the cracking activity at this reaction condition giving high selectivity of LPG but there must be corresponded with Si/Al ratio of zeolite. High conversion of C_5 was observed by using HZSM-5 with low Si/Al ratio, vice versa; low conversion was observed on high Si/Al ratio. For HZSM-5 with Si/Al ratio of 28, 180 and 500, the C_5 conversions were 85%, 27%, and 3.5% respectively. All threes catalysts provided LPG as main products but the amount of aromatics and C_9+ were increased coupling with lowered LPG when Si/Al ratio was decreased. These revealed the Lewis acid site acted as major role in cracking to produce LPG and then oligomerized to produce high molecular weight molecules.

To increase aromatics selectivity, some metals were modified into HZSM5 with Si/Al = 180. The results were shown in Figure 1. and 2.





These depicted the alternating path way of forming high molecular weight molecules when metal was incorporated in catalytic reaction, especially Ga and Zn provided high aromatic selectivity.