Chapter 4

Summary and Conclusion

The work described in this study covers the synthesis of Titanium(IV) complexes with a series of bidentate phenols including that derived from important *C2*-symmetric precursor such as 2, 2' binaphthalene 1,1 diol (BINOL). The interesting chemistry associated with the solid state & solution behaviour of the isolated complexes has been emphasized based on analytical and spectral data. The complexes were synthesized by following an alcohol exchange protocol using readily available starting materials.

All the titanium and complexes (**1-28**) were investigated as catalysts for polymerization of ethylene under different reaction condition in presence of alkyl aluminum co–catalyst.

The Ti-catalysts were found to be highly active in polymerizing ethylene to predominantly low molecular weight polyethylene. The influence of reaction pressure & temperature had a marked effect on the overall productivity of polymer. The steric effect on the ligands showed limited influence on the catalytic activity but no definite trend could be established on structure- activity properties.

One of the key findings that lead to higher catalytic activity was the use of ethylaluminum sesquichloride as co-catalyst. Almost invariably this co-catalyst showed better activity compared to conventional alkylaluminums such as Et_3Al, MAO etc. Similarly the application of higher ethylene pressures & higher temperature lead to better catalyst performance. Some of these trends are depicted schematically in Figs. 4.1 – 4.3. A brief study of effect of different solvents indicated that chlorinated aromatic solvent such as chlorobenzene showed increase in productivity of polyethylene than that for toluene. However, aliphatic hydrocarbon solvents such as hexane resulted in poor activity as shown in Fig. 4.4.

The unique polymer characteristics such as lower molecular weights, high crystallinity and narrow dispersities exhibited by polyethylenes obtained with these catalysts closely resemble the properties of commercially important synthetic micronized polyethylene waxes.

The close resemblance of polymer properties to commercially important synthetic polyethylene waxes hold promise for developing alternative cheaper catalysts for this process. As a benchmark for comparison of polymer properties with that obtained in this work a known sample of micronized PE-wax was used. Commercial PE waxes, because of their unique physicochemical properties serve as aids in a variety of plastics processing applications to enhance lubricity, controlling set /softening point of hot melt adhesives, impart slip and rub resistance in printing inks and improve the fusing property in toner formulations etc.

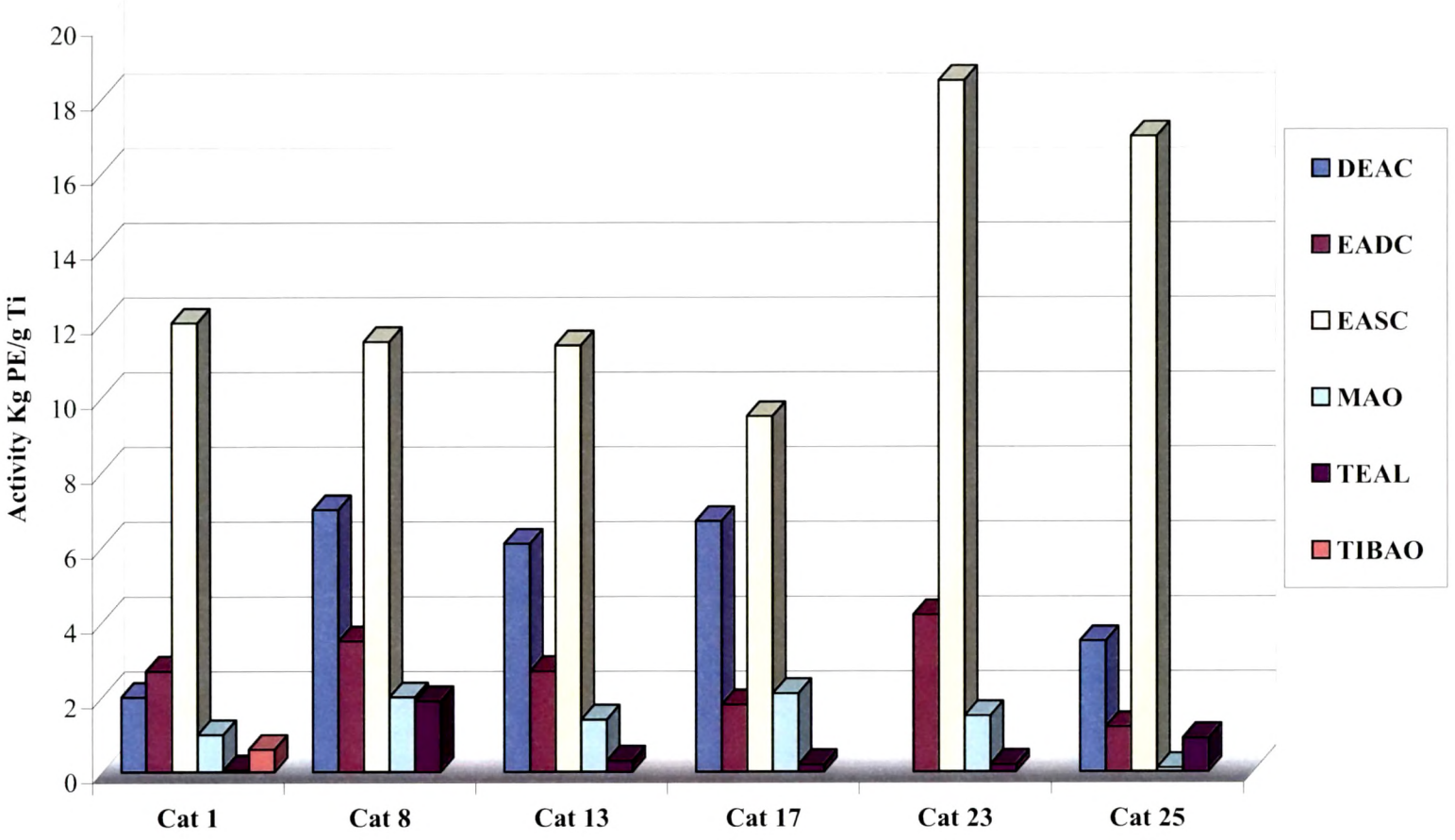

Fig. 4.1. EFFECT OF CO-CATALYST ON ETHYLENE POLYMERIZATION

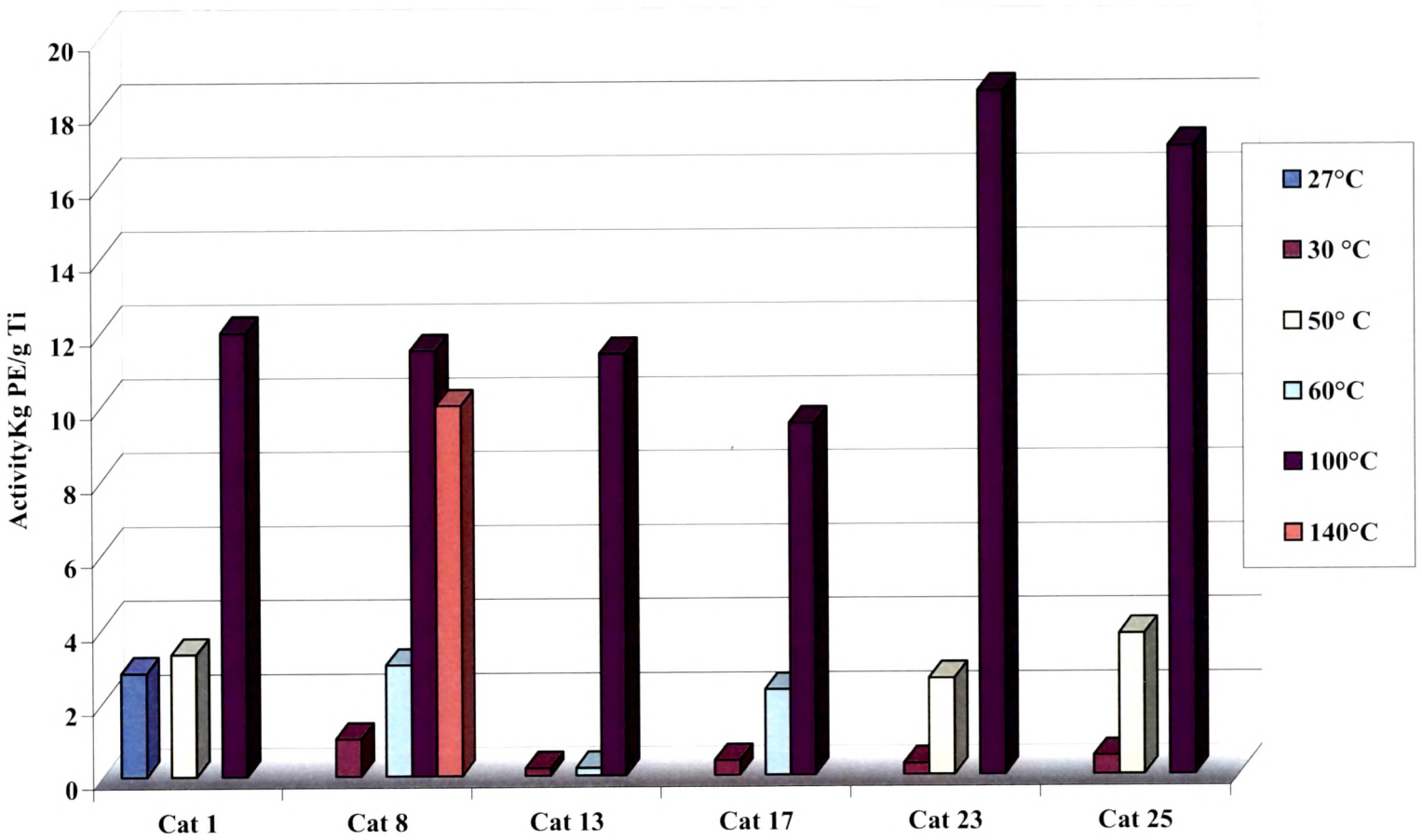

Fig. 4.2 EFFECT OF TEMPERATURE ON ETHYLENE POLYMERIZATION

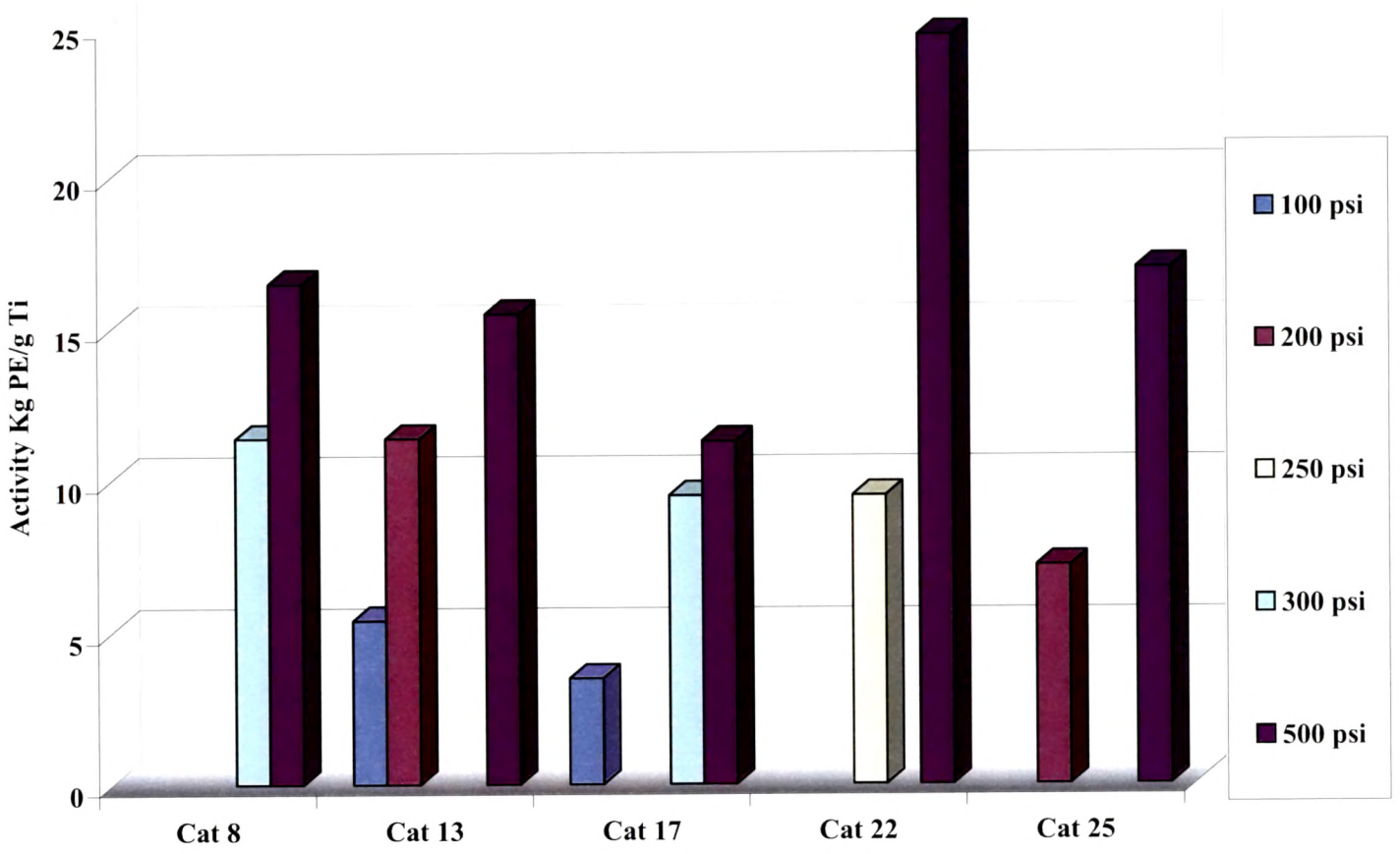

Fig. 4.3. EFFECT OF PRESSURE ON ETHYLENE POLYMERIZATION

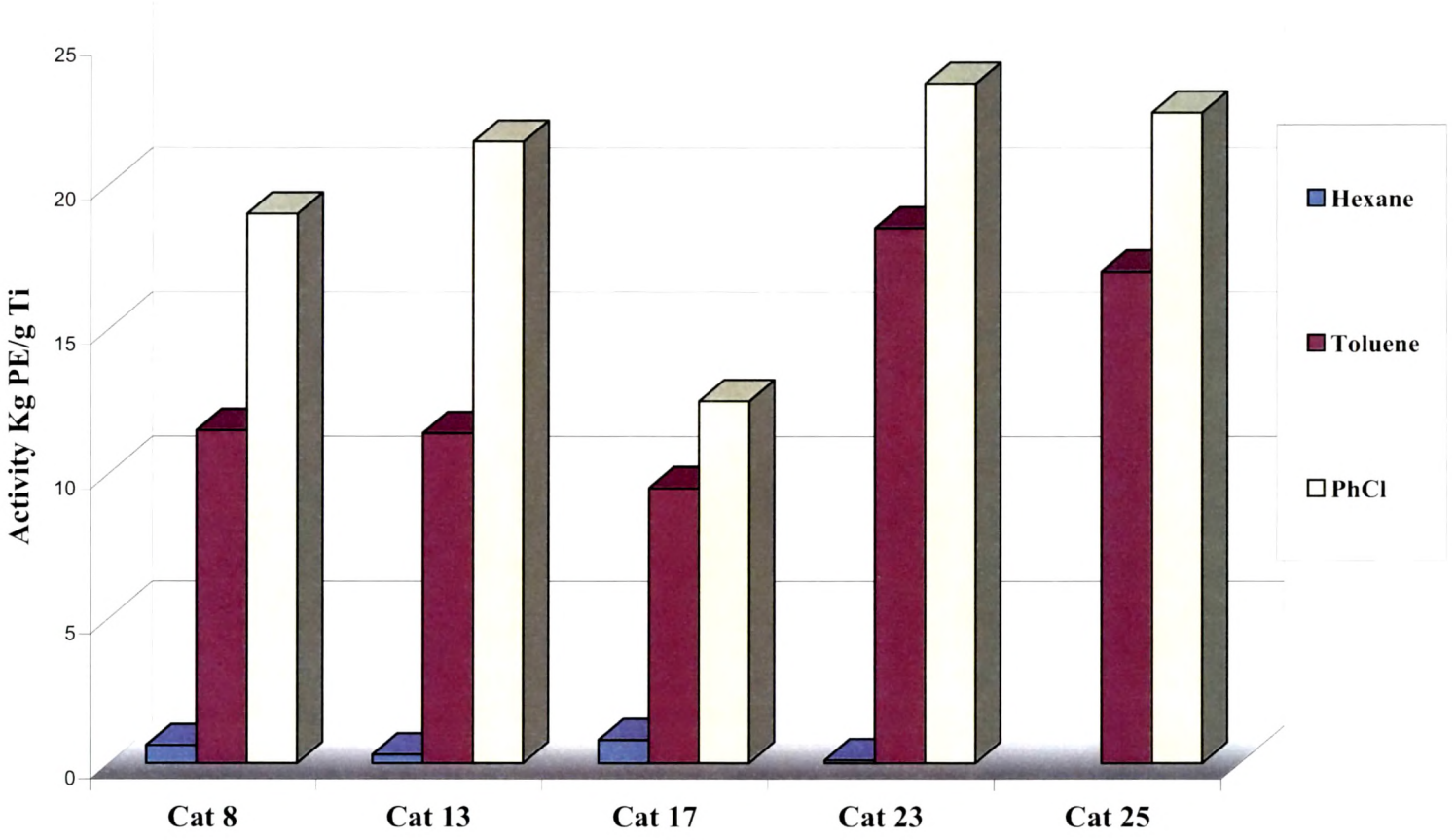

Fig. 4.4. EFFECT OF SOLVENT ON ETHYLENE POLYMERIZATION