CONCLUSIONS

With respect to the WO_3/ZrO_2 catalyst under investigation in this research, the following conclusions can be made:

1. The tungstena/zirconia catalyst is active for coupling methanol and isobutanol to methylisobutylether (MIBE), but sideproducts are formed that consist mainly of isobutene, octenes, and dimethylether.
2. When the reaction temperature is increased above 135°C, the stable tungstena/zirconia catalyst is very good for dehydration of isobutanol to isobutene, even in the presence of methanol.
3. Ether and isobutene synthesis over the tungstena/zirconia catalyst could be described by Langmuir-Hinshelwood kinetics in which competitive adsorption of the two alcohols on surface Brønsted acid sites is a dominant feature and is consistent with a dual-site mechanism, similar to that previously described with Nafion-H [1,6], that proceeds *via* a S_N2 pathway.
4. The surface concentration of the accessible acid sites on the tungstena/zirconia catalyst is lower than expected from the tungstate content and are more diluted than observed with the Nafion-H catalyst.
5. The Brønsted acid sites on the tungstena/zirconia catalyst are heterogeneous since stronger amine bases detect (titrate) more Brønsted acid sites.
6. From the modelling study with the prototype sulfonic acid moiety, it is shown that the transition state barrier from the free reactants, ≈16 kcal/mol, is comparable to the experimental 15 kcal/mol obtained with the Nafion-H resin [1,14].