

## A discussion of translation of zeolite discovery into commercial catalyst and adsorbent use

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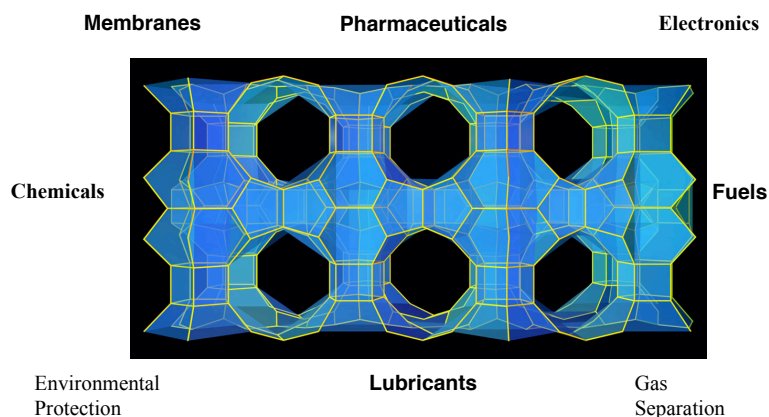
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### Introduction

In this presentation I will contrast the exciting initial work which leads to new zeolite and molecular sieve discovery, to the range of hurdles to be overcome in translating a synthesis discovery on to an application fit and then to a commercial reality. Researchers continue to make exciting breakthroughs in finding new 3-dimensional structures with topologies organized around the construction of linkages of symmetric inorganic nets. Indeed the research groups of Treacy and Deem have each introduced a 4 order-of-magnitude increase of possible structures over those discovered. Whether the materials are comprised of silicate, aluminophosphate other oxides, or metallo-organic frameworks, most of the formation chemistry requires a guest/host interaction. Experience has shown us that most of these materials form in chemical reactions which feature self-assembly, a process with many small energy change steps. To achieve porosity for our application work, removal of the guest molecule without damaging the host support is an important parameter. Recent strategies have emerged to facilitate this process

Once an application can be identified there are a number of technical and economic factors to be considered. I list a variety of potential uses for molecular sieves in the accompanying figure. Most attractive for implementation is the case when a novel zeolite or molecular sieve can be used in a "drop-in" replacement approach. The engineering support aspects are already in place. But sometimes new technology must also accompany the use of the new catalyst material. Additional expenses raised by this step, by the cost of raw materials, by the synthesis cost for new zeolite materials, by the protection or post-synthetic steps which may be needed, all introduce uncertainty as to the commercial feasibility.

Chevron has had a history of developing new catalyst systems which use zeolite or molecular sieve components and has had to face many of the issues raised above. I will try to give a few examples of emerging strategies designed to meet these challenges so that incrementally we can participate in introducing into the market place a few new molecular sieves from amongst the great variety of materials discovered.



**Figure 1.** Opportunities for molecular sieves continue to grow.