Chapter 1

Catalytic Processes in Organic Conversions

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1. Introduction

Catalytic conversions of organic compounds are the heart of modern chemical industry. Few bulk or specialty organic chemicals are produced nowadays that have not been touched by catalysts either directly or indirectly in the synthetic sequence. This review of catalyzed organic reactions is limited to heterogeneous catalysts and mainly to chemicals of industrial importance having functionality beyond those of simple olefins and aromatics. Its aims are to illustrate the diversity of chemical transformations that can be achieved, to discuss the interplay of catalyst and chemical properties of the organic reactants, to show how various intrinsic problems can be minimized, and to suggest the type of catalyst suitable for various reactions.

Organization of this review is based on the type of reaction being catalyzed, rather than the class of compound produced with the intent of emphasizing general relationships between catalyst, functionaility, and reaction. Space limitations preclude details of catalyst functioning, but many leading references to this area are included for interested readers.

2. Hydrogenation

One of the most useful experimental and industrial means of achieving controlled transformations of organic compounds is through selective catalytic hydrogenations. In total number of applications there are probably more examples of industrial hydrogenation than any other type of reaction. The reason for this exceptional usefulness of hydrogenation is not hard to find. Most functional groups can be reduced readily in high regio- and stereo-selectivity, often under mild conditions. An attractive feature of catalytic hydrogenation is that the characteristic properties of various catalysts toward each functional group is likely to remain invariant, with due allowance, of course, for overall structure. A consequence of this is that development of a new use is not apt to require development of a new catalyst;