

Mixed oxide catalysts derived from Hydrotalcite – some conceptual reflections

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It is tempting to write on the topic how the substances which are called hydrotalcites which are not themselves are not much of a catalyst have become famous as catalyst precursors. After all the final catalytic phase obtained is a simple oxides in some definite proportion. However, the generation of these systems from hydrotalcite phases appears to be more efficient than simple mixed oxide system generated in any other means. The observations in literature that the systems derived from hydrotalcites are good and in most cases efficient catalyst systems have to be recognized and accounted for. The following questions may be of relevance in this context.

1. In what sense the mixed(?) oxides generated from hydrotalcites are better systems as compared to other mixed oxides obtained by any other means since as per the composition one may not be able to find much of a difference since one can generate compositionally equivalent mixed oxide systems.
2. Is there any limitation to generation of mixed oxides from hydrotalcites precursors as compared to conventional methods of generating mixed oxide?
3. What is the specific role of the anions like hydroxide and carbonate ions in the precursor hydrotalcites and also on the new oxide compositions that are generated from hydrotalcites.
4. In what chemical property, the catalyst systems generated from hydrotalcites, differs from the oxide systems generated from simple mixed oxides.
5. It is generally conceived that the acid/base property of the oxides derived from hydrotalcites are different that of the other mixed oxide systems. Is there any specific reason for such an expectation?
6. Can one a priori decide what will be the ultimate compositions of mixed oxides that can be generated from hydrotalcite precursors?
7. Is there any specific relation between the ratios of the anions especially if the hydrotalcites are obtained from hydroxide/carbonate combination.
8. Is it possible to predict the variation of activity for a given catalytic reaction based on the composition of hydrotalcite precursor?
9. Why does the mixed oxide grains formed from hydrotalcites behave differently from the grains formed from other mixed oxide preparations?
10. Are there any specific postulates to predict the direction and extent of property change as a function of the composition of the hydrotalcite precursor?

We have only listed some simple but necessary questions to understand the behavior of hydrotalcite precursors and their catalytic activity. These are listed here only to provoke an active mind.