

specified sulphuric acid based commercial electrolyte intermediate layers of nickel proved to be ineffective for corrosion protection, as did palladium. In chloride-containing solutions silver proved to be very effective, not only due to its rather high nobility but also because of the formation of insoluble silver chloride corrosion products. Very good corrosion resistance under the test conditions was shown by the layered combination: platinum (outer)/Miralloy copper-50 tin (intermediate)/copper substrate, making this a very satisfactory alternative to totally precious metal systems.

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#### References

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## Symposium on Fine Chemical Manufacture

Platinum metal catalysts have an increasingly important role to play in producing materials for the healthcare, plant protection and electronics markets. This is a conclusion drawn from the recent symposium entitled "Catalysis in Fine Chemical Manufacture" organised by the Royal Society of Chemistry from 10–12th July, at the University of Birmingham. Of the fourteen papers given, which covered a broad spectrum of catalytic subjects, eight contained references to platinum catalysed reactions, and three drew extensively on platinum metal catalysis to illustrate the importance of matching structure and function in catalysis. These are reviewed here.

Professor P. B. Wells of the University of Hull considered the objectives of catalyst design to be the preparation of catalytically active material in which the chemical and physical properties of the active sites are not degraded during use, and the minimisation of side reactions so that the catalysed reaction results in marketable products. These can be achieved through modification of the active site environment, by surface treatment to give carbonaceous or sulphur deposits, by occlusion of hydrogen during reaction, or by the deliberate choice of a metal-support combination which interacts beneficially under the reaction conditions. With the platinum and titania combination, reduction of the  $TiO_2$  to  $Ti_2O_3$  occurs locally, facilitating the passage of electrons from the metal to the support. With certain supported osmium clusters activity is dependent on the extent of electron transfer. Sintering is linked to metal-support interactions, and the anchoring of small platinum crystallites on silica by Pt-O-Si bonds helps to retard sintering.

Selectivity has been improved by the use of multifunctional systems, for example bifunctional platinum reforming catalysts and polyfunctional zeolite-based catalysts.

In his lecture "Composition and Structure of Catalysts for Vapour Phase Reactions", Professor G. C. Bond of Brunel University described fixed and fluidised bed catalysts. Fixed bed reactors utilise large particles such as pellets, while fluidised bed reactors employ small particles of uniform size. Otherwise the catalysts are very similar, being composed of an active phase (a platinum metal), a support (such as alumina or silica), and a promoter which may alter the texture, electronic structure or poison resistance of the combination – as with the addition of rhenium to a platinum reforming catalyst. In phenol hydrogenations the catalyst is bifunctional, the platinum metal reducing the aromatic ring and the support acid function rearranging the intermediate to give a cyclic ketone. Metal location is important as it affects the mass transport within the pores. This factor is to a large extent determined by the method of preparation; fast absorption from solution gives uniform deposition within the pores while slow absorption allows metal to deposit at pore mouths.

Metal dispersion and location and the effect of these parameters on the activity-selectivity of reactions was the main theme of Mr I. L. Dodgson's lecture. He described the types of palladium on charcoal catalysts manufactured by Johnson Matthey Chemicals for liquid phase reactions, discussed how their physical structure controls their behaviour in selected industrial reactions and recommended appropriate catalysts.

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