METAL PRICES AND THE COST OF PGM CHEMICALS

The selling price of chemicals that contain the platinum group metals (pgms) is made up of two major aspects: manufacturing costs and the metal price. For metal compounds made from the most used (and more costly) pgms: platinum, palladium and rhodium, the manufacturing element of the total cost is relatively small, typically around 0.5 to 1.5%. Therefore, for large-scale use of manufactured metal compounds involving platinum, palladium and rhodium (1), the overall cost is directly related to the intrinsic metal value in the compound. This cost is, however, often offset as these metals can be recycled, and this reduces the impact of the market price on the overall economics of the process.

However, for the less commonly used (and less expensive) pgms: iridium, ruthenium and osmium, the manufacturing element of producing metal compounds can range from 20 to 70% of the total cost. The price of such compounds is still influenced by movements in the intrinsic metal price, but to a lesser extent.

The human, technological and investment efforts required of the primary producers (the mining companies) to extract and refine the ore cannot be overstated (2). While the market, responding to supply and demand, functions for the well-being of the pgm industry as a whole. JOHN E. GOURD

References

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Palladium Perovskite Catalysts for Suzuki Couplings

Palladium (Pd)-containing perovskites have the ability to self-regenerate under oxidative and reductive conditions, while suppressing growth of metallic Pd particles, so could be useful in automotive emissions control (1). These properties could also promote activity and long life in catalysts used in organic synthesis, where similar problems in catalyst deactivation occur.

Now researchers from the University of Cambridge, U.K., have studied Pd perovskites, such as $LaFe_{0.57}Co_{0.38}Pd_{0.05}O_3$, as catalysts for cross-coupling reactions, during Suzuki reactions of aryl halides and boronic acids (2). It was found that aryl bromides cross-coupled with boronic acids in the presence of 0.05 mol% Pd catalyst with K_2CO_3 as base to give the requisite biaryls in high yields (95%). Aqueous alcohols were identified as effective solvents and heating to 80°C. The catalyst was removable from the reaction mixture.

In order to study the scope and limitations of the catalyst, a reaction using 1 g of 4-methoxybromobenzene and 1 mg of (0.0038 mol% Pd) catalyst was performed. This resulted in a 93% conversion corresponding to a turnover number of 27,000.

ICP-MS showed particularly low levels of residual Pd which suggests that the catalyst may operate by a 'release and capture' mechanism, with the perovskite acting as a reservoir and scavenger for the active catalytic species. This perovskite functioned as an air-stable, reusable catalyst for Suzuki cross-coupling under mild conditions, with low levels of Pd leaching.

References

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Replicating Magnetic Nanostructures

A single-step, non-contact, large-area, high resolution process for effective patterning of a complete magnetic recording structure has been reported by a team from Germany and Austria (A. Dietzel, R. Berger, H. Loeschner, E. Platzgummer, G. Stengl, W. H. Bruenger and F. Letzkus, *Adv. Mater.*, 2003, **15**, (14), 1152–1155).

Using large area Ar^+ ion projection, direct structuring was achieved via a stencil mask a significant distance from the surface of a 1″-format hard disk. This transferred a complete magnetic nanostructural recording pattern to a Co/Pt multilayer.