

determines the flow through the composite membrane and therefore in industrial usage the platinum layer thickness would be minimised. This study shows that a membrane reactor process could be economically and technologically feasible for the decomposition and separation of hydrogen sulphide in an environmentally friendly fashion. Applications proposed for this type of technology include the clean-up of coal-derived gases, recovery of hydrogen from hydrogen sulphide containing refinery gas streams and the sweetening of sour natural gas.

Outlook

The papers collected in the special issues of *Applied Catalysis* and the *Journal of Membrane Science* illustrate a variety of approaches for har-

nessing the potential of combined membrane and catalyst technologies. These publications represent the latest in an increasing number of recent articles on this topic, a testament to the exciting potential of these techniques. The use of platinum group metals in membrane reactors is justified by their unique catalytic properties and the dividend available through the "process intensification" which they can produce. Industrial applications for membrane catalysis will depend on developing effective, commercial scale, membrane reactor systems in a more economical manner. This task will require a multi-disciplinary approach involving ceramicists, catalyst scientists, chemists and materials scientists. Judging by the reviewed papers, this process is already underway. M.L.D.

The Use of Rhodium in Selenium Detection

There is a need to be able to measure small traces of selenium in ground water and river water quickly and accurately, because of the damage that a potential toxic level can cause to the environment. In the past selenium has been detected by electroanalytical techniques, such as anodic stripping procedures and more recently by cathodic stripping, which is based on the preconcentration and subsequent reduction of mercury and copper selenides.

Now, researchers at the New Mexico State University, Las Cruces, U.S.A., have discovered that the sensitivity of selenium detection by a cathodic stripping voltammetric procedure can be greatly improved by adding rhodium instead of copper selenide to the sample mixture (J. Wang and J. Lu, "Ultratrace Measurements of Selenium by Cathodic Stripping Voltammetry in the Presence of Rhodium", *Anal. Chim. Acta*, 1993, 274, (2), 219-224).

This extremely sensitive cathodic stripping voltammetric method is based on the accumulation and subsequent reduction of a rhodium selenide layer on the hanging mercury drop electrode. Insoluble layers of rhodium selenide are formed on the mercury surface during the preconcentration step. The reduction of the accumulated rhodium selenide gives a sharp cathodic stripping response which is around ten to fifty times larger than the analogous copper or mercury selenide peaks, respectively. The best assaying results have been obtained for a sample containing 0.1 M sulphuric acid solution, 10 µg/l rhodium and preconcentration at

- 0.2 V. A fast linear scan follows which gives a high signal to background characteristic and faster assay. Under optimum conditions, an extremely low detection limit of 0.5 ng/l of selenium can be achieved, following a three minute preconcentration.

This method is fast, ultrasensitive, giving high selectivity and precision, and can be applied for selenium measurements in complex environmental and biological samples.

Platinum Alloy Film in Optics

To achieve useful total reflection optical systems for imaging and focusing soft X-rays, the mirrors used are required to have smooth surfaces and to increase the grazing angles of incidence. Materials of high bulk density coated on the mirrors can enlarge the grazing angle. Film surfaces can be made smoother by combining materials.

Researchers in Japan have now developed and characterised high density platinum-palladium alloys which give smoother film and better performance as reflecting surfaces (K. Nakajima, S. Sudo, H. Kanda, T. Ishii and S. Aoki, *Jpn. J. Appl. Phys.*, 1993, 32, (3A), 1275-1278).

Sputter deposited platinum-palladium alloy was characterised by X-ray reflectivity measurements. Grain growth of the polycrystalline platinum film was controlled by adding small amounts of palladium. A platinum-1.8 atomic per cent palladium film has a 1 ~ 6 per cent higher reflectivity than a pure platinum film at grazing angles up to about 1°.