Thus the influences of palladium membrane coating on hydrogen permeation through iron were discussed by Y. Hayashi and colleagues (University of Fukuoka, Japan) and comparisons of hydrogen permeabilities in palladium-yttrium(gadolinium)-silver and palladium-yttrium-indium(tin, lead) alloys were reported by Y. Sakamoto and colleagues (University of Nagasaki). Evidence from observations of 'uphill' hydrogen permeation effects, originating from self induced strain gradients, and consequent Gorsky effect hydrogen migration, that result from the lattice expansive nature of hydrogen interstitials, was reviewed by F. A. Lewis (University of Belfast). A survey of potential applications and general prospects for the development of palladium alloy membranes for hydrogen purification and catalytic utilisation was presented by V. G. Sorokin ("Lenneftekhim", St Petersburg), and the application of mathematical modelling to clarify the process mechanisms of hydrogen permeation in palladium alloys was outlined by A. M. Dobrotvorsky and colleagues (also of "Lenneftekhim"). A broader general assessment of the prospects for utilising palladium and palladium alloys in future hydrogen research was presented by P. G. Berezhko (Scientific Research Institute of Experimental Physics, Arzamas, Russia).

Substantial details of the contents of the papers were available in books of abstracts, most of which were in Russian, the remainder being in English. The location of the next conference in this series has yet to be finalised, and enquiries should be addressed to Professor V. A. Goltsov in Donetsk. F.A.L.

A Copper-Free Ruthenium Perovskite Superconductor

In recent years layered perovskite structures exhibiting superconductivity at low temperatures have been synthesised. Work on these compositions, with various substitutions, has resulted in materials which display significantly higher transition temperatures, and hence are superconducting at relatively higher temperatures. These increases in transition temperature are sufficiently large to suggest that a market for such materials is likely to develop during the last few years of this century.

Materials developed to-date are based upon systems, such as $La_{2-x}Ba_xCuO_4$, where the copper is present in layers, together with oxygen. This layering is necessary to induce superconductivity, as are the barium substitutions into the basic perovskite structure. However, work is now reported on the evaluation of a perovskite compound based on $Sr_{n+1}Ru_nO_{3n+1}$ (Y. Maeno, H. Hashimoto, K. Yoshida, S. Nishizaki, T. Fujita, J. G. Bednorz and F. Lichtenberg, *Nature*, 1994, **372**, (6506), 532–534). When $n=1$ Sr_2RuO_4 is formed, having crystal structure isostructural with $La_{2-x}Ba_xCuO_4$.

Single crystals of Sr_2RuO_4 were cleaved, and measurements made which revealed superconductivity below about 1 K. The transition temperature, T_c, was 0.93 ± 0.03 K. Critical current density measurements were made at 0.32 K.

While Sr_2RuO_4 does not possess the higher transition temperatures likely to be the basis for future opportunities, the system may be important for a basic understanding of such materials, since comparison with other superconductors with significantly different T_c values will help to explain the role of the various electronic components of the superconducting effect.

In conclusion it should be noted that this work demonstrates that the presence of copper is not a prerequisite for the existence of superconductivity in layered perovskites, but that the high transition temperatures possible when it is present would appear to indicate that it has a special role. On this basis the existence of superconductivity in Sr_2RuO_4 may be a valuable discovery, particularly to clarify the mechanisms permitting superconductivity. A.S.P.

A Palladium Source of Protons

The use of very bright gaseous sources for lithographic purposes has been suggested, but no practical ion sources have been found.

Now, however, researchers from the Muroran Institute of Technology in Japan, have made a preliminary proton ion source using palladium (T. Teraoka, H. Nakane and H. Adachi, *Jpn. J. Appl. Phys., Part 2 Lett.*, 1994, **33**, (8A), L1110–L1112), making use of the fact that palladium has the highest hydrogen permeability of all metals. The needle-shaped palladium allows hydrogen diffusion at the same rate as it permeates in bulk palladium. The ion source must be operated so as to avoid a phase transition which occurs at 100–200°C in the palladium. The ion source is expected to be useful for future microfabrication technology.