

transient heating period involved in this process. However, the thermal shock experienced by the reeds during encapsulation has been shown by Palumbo to result in cracking of the deposits from standard commercial ruthenium electrolytes (11).

The use of a 1  $\mu\text{m}$  soft gold pre-plate and a 1  $\mu\text{m}$  ruthenium deposit reduced this effect as differential expansion of the ruthenium and the 49 per cent cobalt-49 per cent iron-2 per cent vanadium reed blade is compensated by the gold pre-plate, whereas conventional deposition methods rely on only a flash deposit of gold. However, the authors found that the ruthenium deposits still cracked due to their inherent

stress unless a pure  $\text{K}_3[\text{Ru}_2\text{NCl}_8(\text{H}_2\text{O})_2]$  electrolyte and divided cell assembly were employed. Over 50,000 reed blades have been plated by this technique, but no details of long-term contact performance have so far been published.

Clearly considerable interest has been taken in ruthenium plating for electrical applications over the last decade by a number of industrial establishments. Stimulated by the greatly increased price differential between ruthenium and gold, development work is continuing and will no doubt include rigorous studies of long-term electrolyte and deposit performance for electrical contact purposes.

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## Ullmann's Encyklopädie on Platinum

Since 1914 Ullmann's Encyklopädie der technischen Chemie has been a valuable work of reference to German-speaking chemists and has passed through several editions. The fourth edition, much enlarged and revised, is now in course of publication and Volume 18 has now appeared, including a section on the platinum metals.

This has been prepared by Dr. Hermann Renner of Degussa, who has succeeded in com-

pressing a great deal of information on their refining, properties, chemical compounds and applications into some 32 pages. This replaces the former chapter in the third edition of 1963, written by the late Dr. Ruthardt of Heraeus. Many developments have taken place in the meantime, and the references—totalling 177—include a mention of everything of importance to an industrial chemist, or metallurgist, that has been reported up to the end of 1979.