

Preface

EDITORIAL INTRODUCTORY REMARKS

The decision to hold the 3rd symposium 'Analytical Chemistry in Exploration, Mining and Processing of Materials' in August 1992 was made because the previous two (1976 and 1985) had proved that there was a real need for giving scientists, engineers and mining technologists a combined forum to discuss the analysis of materials and associated problems from their various points of view. Another reason was that there have been many advances in chemical and physical analytical technology, vital to the discovery, production and characterization of materials. A discussion forum could be of great importance to Southern and South Africa, emerging from the cloud of economic, information-restricting and scientific sanctions, imposed for the last 10 years.

As with the past two symposia in the series the International Union of Pure and Applied Chemistry again agreed that the symposium could be held under its aegis. This organization has always supported the principle of free communication among bona fide scientists, but for the first time in many years, nearly every country in the world allowed their scientists to travel to South Africa.

The enthusiastic discussions, the constructive arguments and suggestions and the establishment of friendship ties between delegates from all corners of the globe, were proof indeed of the success of the meetings and the symposium generally.

This volume of the keynote speakers' papers will serve to remind the delegates of a sound and much enjoyed symposium. It should also bring to those who could not attend, an indication of how important the chemical analysis and characterization of materials has become in virtually all spheres of life, especially those related to the production and improvement of materials. The papers provide an excellent overview of the fields of importance in the ever changing, ever emerging analytical techniques and the areas of application.

The organizers are most grateful, not only to IUPAC for its unfailing support over the years, but also to those people, authorities, and organizations that made it possible to hold this symposium.

OPENING SPEAKERS

The symposium was opened by Mr Bobbie Godsell, President of the Chamber of Mines who drew attention to the importance of knowledge ('know-how') in the development of a country such as South Africa. He stressed the danger of politicians being tempted to seek to control and manipulate commerce and industry. South Africa faces many challenges in the future and knowledge will play a vital role in meeting them. At least one of these is the ability to exploit the mineral wealth and other natural resources. This should be done in a way which is both economically usable and ecologically sustainable.

The deputy minister of finance Dr Theo Alant sketched some of the important technological projects supported by government finance. They had played an important role in developing industries. A fine example is the SASOL chemical exploitation of S.A.'s vast coal reserves to produce gasoline, oil and byproducts. The spill-off into other areas of the economy had been remarkable.

In addition the MOSSGAS, underwater gas for fuel and chemicals, project had been heavily funded.

The importance of political stability on the economic and technological program of a country was stressed.

FUTURE OPPORTUNITIES

Dr A.M. Edwards, President of the Council for Minerals Technology gave a brief historical review of mining in Southern Africa and how it had been largely responsible for the development of the country. He reviewed many recent developments including the organic chemical sector, the nuclear and the coal mining developments. In looking to the future he showed how beneficial it could be if South Africa should advance beyond the primary stages of ore exports to further beneficiation and especially final product manufacture.

'If we break down the beneficiation of minerals into four consecutive phases, we can observe the following: We are well positioned when it comes to selling simple concentrated, i.e. Phase 1 products. We have already made a reasonable entrée into Phase 2 beneficiation, namely the production of large-tonnage semi-beneficiated products; but are poorly developed in the production of high-value sophisticated products (Phase 3) from which final artifacts i.e. commodities can be made. Phase 4, the generation of finished products for export, is virtually non-existent. Since the value of product of each consecutive phase increases exponentially, the potential for revenue-earning on a macro scale can be regarded as nothing else but phenomenal.' Examples mentioned were chromium and the production of stainless steel, and precious metals and the jewellery making industry.

NEW DEVELOPMENT IN MINERAL PROCESSING

Dr R.E. Robinson, an acknowledged and well known industrial chemist drew attention to the fact that South Africa's economy largely depended on the precious metals mined. However, the lifetimes of these mines are limited and base metals have equally great potential. Many of the base metal minerals come from small mines occurring in metallogenic provinces where a number of such deposits are grouped together in a geographical area of not more than 50 or 100 kilometres in dimension. Most of these are dormant because the cost of their development is too high. There is thus a need for simple manual methods of geochemical evaluation to enable small entrepreneurial companies, working in collaboration with a geological survey organization, to discover and develop these mines. The same applies to analytical methodology.

A new development for exploration by South Africans is 'Microwave Tomography'. This results in a picture originating from microwaves of an area where levels of sulphide mineralization is indicated by different colours. Details were given.

Dr Robinson reviewed the further beneficiation of ores containing mixtures of base metal sulphates. Prohibitive costs of using the more common flotation and associated technology have encouraged the possibility of using other new techniques, such as hydrometallurgy. This involves the dissolutions of all the valuable sulphide constituents in a suitable leaching solution and then separating and recovering various metal components by solution based separation techniques; these are not unlike methods used in analytical chemistry.

The problems associated with developing the necessary expertise and education in Southern Africa were discussed.

The symposium was opened and the technical and scientific discussions followed.

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