PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY A MATHEMATICAL, PHYSICAL & ENGINEERING SCIENCES

Welcoming Remarks

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Welcoming remarks

By A. Kelly, F.R.S.

It is my very pleasant duty to welcome participants to this Conference organized by the Metals Society, The Royal Society and the National Physical Laboratory. The National Physical Laboratory has of course been the moving spirit in bringing it about. It has turned out to be a truly international conference with one-third of the papers coming from overseas and those from 11 countries. I think that the importance and significance of the Conference, and the energy of the principal organizer, can be judged from that fact and also from the help that has been received, which we acknowledge, from the U.S. Army and U.S. Air Force Office in Europe, the British Gas Corporation, G.K.N., Tube Investments, the U.K.A.E.A. and Alcan, besides the Royal Society who provided the travel funds and the lecture theatre. We are very glad to acknowledge all this help and are very grateful for it.

The provenance of the papers is interesting: 40 % come from industrial concerns, 30 % from universities and 30 % from Government laboratories. It is with some pride as Chairman of the Engineering Materials Requirements Board of the Department of Industry that I note that most of the N.P.L. papers are in fact financed by that Board. The principal organizing group, as I have said, comes from one of our great national laboratories, the National Physical Laboratory, and one can see there one function of that Laboratory, which is forming a nexus between the activities in Industry and the Universities; this is an important role of our national laboratories.

The title that has been chosen for the Conference is 'Residuals, additives and materials properties' and we did consider in the early stages of planning whether we should say 'properties of metals' instead of 'materials'. We decided against that because metals are of such overwhelming importance in mechanical engineering and because, as I am sure the first paper will show, the techniques for examining the effects of additives and residuals are so much more advanced in the metallic field. We felt, perhaps with some chauvinism, that those concerned with these effects in glass and plastics might learn from this Conference.

I do not wish to usurp the place of Dr Hondros who is going to set the scene in the first paper and who is the principal organizer of the Conference, but I should like to make one or two technical remarks. The importance of residuals left in engineering metals, either as a result of refining or else accumulating during recycling, is bound to grow and I should like to give two examples. An EN16 steel when killed by aluminium shows little or no aluminium in the chemical analysis; all of the aluminium is present as alumina, Al_2O_3. But those inclusions of alumina, especially those at the surface, cause the stress concentrations and these in fact control the initiation of fatigue cracks in low cycle fatigue. This is an example of a material which when used in highly stressed conditions has its properties determined by the elements which are not shown in the chemical analysis.

The second important reason for an interest in the things that we are to discuss is the growth in importance of the recycling of many metals. At present in this country, some 30 % of our aluminium is recycled, 40 % of copper and 65 % of lead. Recycled material is growing in importance for a number of reasons; one is that in the countries of the E.E.C. recycled material represents the greatest security of supply, another is that it is often cheaper to obtain the

material by recycling and an important aspect of that cheapness is the fact that the energy cost measured, say, in gigajoules per tonne of recycled material is often much less than for primary material. Just think of the figures for aluminium. Primary aluminium requires 327 GJ/t but as scrap costs 10.8 GJ/t. In the United Kingdom, of course, we are not unfamiliar with some of the problems of using recycled aluminium. Those old enough to remember the collecting of saucepans for making of aircraft during the war will recall the great drive to collect aluminium and melt it down. In those years 1941–3 it was in fact the National Physical Laboratory which endeavoured to find out the best heat treatment for various aluminium alloys containing material from remelted saucepans.

The call for papers for this Conference has resulted in a very large response, so much so that in the sessions on high temperature and fabrication effects, we are resorting to poster sessions. I should not say 'resorting to' because I believe that these can be very successful, but it is an indication of the interest in this field and perhaps that interest indicates that those two are the most important sessions.

Following these general remarks, I should merely introduce Dr Hondros who will set the scene for our Conference in detail. I earlier referred to the national laboratories as forming a nexus, a bridge. Another word not often thought of in connection with a bridge is pontiff, usually used in quite another connection, but its origin does indicate the formation of a bridge and the pontiff is expected to speak wisely and authoritatively on many issues. I am sure that our Pontiff Hondros will do that very well.

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