less than the ionisation energy of the free atoms. This so-called work function may be determined from photoelectric measurements. It follows that the energy required to remove an electron from a small cluster of atoms will also be less than the ionisation energy, although certainly more than the work function. Hence both $\triangle H^{\circ}_{at}$ and ionisation energies favour cluster formation as opposed to the formation of simple monometal compounds.

(iii) The electron affinity (E.A.) of the metal atom—for which few reliable data have been obtained—and

(iv) The electronegativity (χ) of the metal atom.

Values of electronegativity coefficients, as derived by Pauling, are given in Table V. Metals with the largest electronegativity values include the noble metals with coefficients in the range 1.9 (silver) to 2.4 (gold). These values may be compared to those of the more electropositive metals rubidium (0.8) and caesium (0.7). As listed above a pure metal has essentially covalent multicentre bonding and replacement of one metal by another of a similar kind produces an alloy with similar bonding. In contrast, if two metals of widely differing electronegativities are employed then an ionic compound results. Such is the case with caesium and gold giving $Cs^{+}Au^{-}$. As such, gold may be regarded as a *quasi* halide. It is worth remembering in any discussion of this sort that electronegativity values are dependent on their source. The Pauling values, derived from bond energies of chemical compounds, tend to be larger than those of Mulliken given by (I.P. + E.A.)/2.

Conclusion

Any simplistic approach such as that offered here can at best offer only a limited guide to the behaviour, both physical and chemical, of the platinum metals. Nevertheless, such a simple model is not without its attractions. Certainly it can act as a useful guide and can offer some understanding of the multitude of factors responsible for the so-called metallic properties.

References

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Progress by Rustenburg Platinum Mines

Rustenburg Platinum Mines has recently reported progress in a number of important areas. Prospecting operations around Potgietersrust, reported here a year ago, are now nearing completion, although it will be some time before metallurgical and feasibility studies are concluded. Expansion at the Amandelbult Section, to provide capacity for a previously announced contract, has been completed, as has the sinking and commissioning of a new shaft at the Rustenburg Section of the mine.

At the Union Section a second electric smelting furnace, shown here, is now fully operational. The rectangular furnace is of the submerged arc type and has six large consumable electrodes. Electric smelting is highly efficient and permits more economical production than the traditional blast furnace. Molten matte, consisting of the platinum metals together with very much larger amounts of iron, copper and nickel sulphides, is periodically tapped from the furnace and fed into the two large refractory-lined steel ladles, each with a capacity of 15 tonnes, for transport by overhead crane to the casting area.