immediate vicinity of the molten surface. As the solute content at the liquid/vapour interface becomes diminished, a concentration gradient is set up within the liquid. At this time, and this may occur very early in the melting operation, material transport in the liquid phase becomes the rate-controlling process. Thus, providing the vapour pressures are favourable and that the pumping speed of the vacuum system is sufficient to maintain a low partial pressure of the solute element, purification should proceed at a rate dependent on the solute diffusivity in the liquid state.

Resulting Purity

An electron beam floating-zone refiner is shown in Fig. 3. Platinum purified in this unit at Materials Research Corporation is zone melted in a nominal 10^{-6} torr vacuum system. The metal rod of $\frac{3}{8}$ to $\frac{1}{2}$ inch diameter is given three zone passes at a zoning speed of 3 inches per hour. It has been found that most of the purification by the degassing and vacuum distillation mechanism occurs during the first zone pass. For appreciable purification by zone melting *per se*, a minimum of three zone passes should be utilised. Although zoning beyond three passes is beneficial, it has been found that three passes is a good compromise between purity and cost of processing.

A detailed analysis of a three-pass zone-refined platinum bar is given in the table. The residual concentration of the interstitial gases – hydrogen, oxygen and nitrogen – is very low. The content of the other metals of the platinum group and of gold and silver has been reduced to very small proportions in general. Platinum of the purity indicated in the table is now very satisfactory for use in microelectronic applications and the zone refining technique described in this article gives good results.

References

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Rhodium-Platinum Thermocouples for Incinerator Control

The disposal of the ever-increasing volumes of household and trade refuse is presenting local authorities with a considerable problem. Incineration under controlled conditions is a practical solution being adopted by a number of authorities (1). At Middleton, Lancashire, Motherwell Bridge Tacol Ltd has installed for the local Corporation the first incinerator of an advanced design which can handle 60 tons of refuse per day at the rate of 8 tons per hour.

Incoming refuse is fed from a hopper to the incinerator grate, which consists of six rollers arranged in descending order at an angle of 30°. Each roller is made up into a unit 8 feet wide and 5 feet in diameter from interlocking grate bar segments between which gaps allow fan-forced combustion air to pass. The rollers slowly rotate and refuse is dried and ignited as it falls from one roller to the next until it finally leaves the grate as fine ash and clinker. Incinerator temperature is monitored and maintained at 900°C by a Petite Q12 indicator/controller fed with signals from a duplex platinum : 10 per cent rhodium-platinum thermocouple in the roof of the combustion chamber.

After leaving the last roller the ash and clinker is quenched in a submerged belt conveyor and is passed on for disposal. The hot flue gases pass via a dust extractor to a 150 foot chimney. A second duplex platinum : 10 per cent rhodium-platinum thermocouple monitors the flue gas temperature at the entrance to the dust extractor and passes a signal to control the introduction of cooling air to the gas stream.

1 *Instrum. Prac.* 1969, 23, (10), 706–707