Instability is often a cause of a number of casting defects including gas porosity; progress is being achieved in improving stability.

The influence of the metallurgy and chemistry of jewellery materials on the processes used in jewellery manufacture was discussed by D. Ott (FEM, Germany). This topic was also picked up by H. Freye (Techform, U.S.A.) in considering the ceramics used in shell casting of high temperature alloys including platinum.

G. Normandeau described the metallurgical training programmes used by his company, Imperial Smelting & Refining Ltd., Canada. This includes subject matter unique to platinum as well as gold and silver. All staff on the shop floor are trained and the impact of this on staff performance and training evaluation was discussed.

Other presentations looked at copyright and patent law, quality assurance and at the metallurgy and properties of other precious metals.

The presentations at this Santa Fe Symposium and previous Symposia are available from: The Santa Fe Symposium, 7500 Bluewater Road NW, NM 87121, U.S.A. Tel: +1 505 839 3249; Fax: +1 505 839 3248; E-mail: ct@tbg.riogrande.com.

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High Breakdown Voltage of Au/Pt/GaN Schottky Diodes

In power electronics (power > 1 MW), silicon carbide, gallium arsenide and gallium nitride (GaN) are being developed as alternative materials to silicon. Silicon carbide is already used in solid-state power electronic devices, such as diodes, thyristors and transistors. Wide bandgap GaN, with high breakdown voltage, is also under extensive investigation for power device uses, but little work has been reported on breakdown in GaN diode devices.

Schottky diodes can switch faster than junction diodes and are often used to measure the quality of material. Now, a team of researchers, from the National Central University, Taiwan, the University of Florida, Sandia National Laboratories, Bell Laboratories, and a consultant, U.S.A., have examined breakdown using Au/Pt/GaN Schottky diode rectifiers (G. T. Dang, A. P. Zhang, M. M. Mshewa, F. Ren, J.-I. Chyi, C.-M. Lee, C. C. Chuo, G. C. Chi, J. Han, S. N. G. Chu, R. G. Wilson, X. A. Cao and S. J. Pearton, *J. Vac. Sci. Technol. A*, 2000, 18, (4), 1135–1143).

GaN was grown by MOCVD on sapphire via NH_3 and trimethylgallium precursors. The ohmic contacts were formed by Pt/Au liftoff. They were annealed before Pt/Au deposition. Optimised high-density plasma etching conditions were developed for GaN, to give minimal degradation in reverse current leakage in *p-i-n* mesa diodes. Reverse breakdown voltages (V_{RB}) of up to 550 V on vertically depleting structures and > 2000 V on lateral devices were obtained. Values for the figure-of-merit $(V_{RB})^2/R_{ON}$, (R_{ON} = on-state resistance) were 4.2 to 4.8 MW cm^{-2}. The reverse leakage currents and forward on-voltages were slightly higher than theoretical minimum values, but comparable with reported SiC Schottky rectifiers. The GaN-devices show promise for use in ultrahigh-power switches.

Damping in Ruthenium Alloys

An important physical property of an alloy is its damping capacity in response to an imparted mechanical force. High damping in iron-ruthenium alloys is closely linked to the amount of ε martensite present.

Scientists at Yonsei University, Seoul, Korea, have investigated the damping capacity of iron-ruthenium alloys, containing 25 and 13 per cent Ru at room temperature, using samples processed to contain various amounts of ε martensite (H.-C. Shin, J.-H. Jun and C.-S. Choi, *Scr. Mater.*, 2000, 42, (10), 981–986).

Fe-13% Ru, which undergoes a $\gamma \rightarrow \alpha'$ martensite transformation to give α' single phase, showed poor damping capacity. Fe-25% Ru undergoes a $\gamma \rightarrow \varepsilon$ martensite transformation and has high damping capacity, dependent on the strain amplitude. For Fe-25% Ru, damping capacity increases with increasing ε martensite content at $< 3 \times 10^{-4}$ strain amplitude. At strain amplitude $> 4 \times 10^{-4}$ it reached a peak for a volume fraction of ~ 42 per cent of ε martensite. Stacking fault boundaries inside the ε martensite plates act as damping sources.