NASA TECH BRIEF

Thin Film Process Forms Effective Electrical Contacts on Semiconductor Crystals

A process has been developed for making microscopic, low-resistance electrical contacts on hexagonal n-type silicon carbide crystals. These crystals are to be used for microelectronic devices and the contacts must be of precise geometry. The process involves vacuum deposition of a 10,000 angstrom layer of aluminum over the entire surface of the crystal, followed by selective etching of the aluminum (using a photoresist mask) to expose the bare silicon carbide in the areas where the electrical contacts are to be formed. Alternating layers of tantalum and gold are then deposited by sputtering to form a 3000 angstrom alloy film (14 percent tantalum–86 percent gold) over the aluminum layer and the bare contact areas on the crystal. Following these steps, the crystal is treated with an appropriate etchant (either a strong acid or a strong base), which dissolves the intermetallics formed with the aluminum mask, leaving the tantalum–gold interdeposited film intact.

Notes:

1. The tantalum–gold low-resistance contacts formed as outlined above are mechanically rugged and chemically stable. They were not affected in devices operated at temperatures of 500°C in an oxidizing atmosphere.
2. Gold lead wires are easily and firmly attached to the contacts by the conventional thermocompression bonding process.
3. Inquiries concerning this innovation may be directed to:

   Technology Utilization Officer
   Marshall Space Flight Center
   Huntsville, Alabama 35812
   Reference: B67-10142

Patent status:

No patent action is contemplated by NASA.

Source: N. P. Formigoni and J. S. Roberts
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