

## **Medical Applications**

Gold plays an important role in medical implants because of its "biocompatibility." One example is the use of gold-coated "stents" inserted into clogged arteries to facilitate blood flow. Because gold is opaque to x-rays, surgeons are able to emplace stents with great precision to achieve optimal effectiveness. Gold is used in other medical implants such as pacemakers and insulin pumps because of its high degree of reliability in micro electronics. Gold has a high level of resistance to bacterial colonization making it is the material of choice for implants where there is a high risk of infection, such as the inner ear.

In pharmaceutical applications, gold is ideal for delivering precise doses of powerful drugs directly into target tissues of the human body, without damaging the tissues themselves, or altering the effectiveness of the material being delivered. This is becoming increasingly important in the treatment of a range of diseases, including cancer and HIV.

On the molecular level, organic and chemical compounds of gold are used in what medical scientists describe as a "pharmacy on a chip," in which a thin covering of gold is used to encase micro doses of drugs on an electronic chip that is implanted in the body. When the chip is electronically activated to dissolve the gold casing, an appropriate dose of drug is released.

Similarly, gold is the preferred material for a branch of medical research the scientists call "biolistics," a combination of biology and ballistics. Strands of DNA are blended with microscopic gold powder and injected into the skin to target cells where researchers can observe the reaction. In this application, three of gold's attributes are crucial: first, its non-reactiveness. Second, the fact that it is opaque means it can be precisely located, just as with the stents. And finally, the high density of gold allows it to achieve the high speed required to penetrate the targeted cell.

**Satellites and Communications** - Gold is used in satellites as part of their electronic circuits, and as a heat shield. Satellites provide information about weather patterns around the world and help track the paths of storms. Satellites help monitor vegetation and environmental change on Earth. Satellites facilitate telephone, radio and television communication around the globe faster than ever before. Satellite tracking and global positioning systems (GPS) are used to accurately establish one's location.

**Aerospace** - The space program depends on the clean, non-corroding electrical performance of gold. Because the metal reflects heat it is used to protect astronauts, satellites and critical electronic components from damage by hazardous X-rays and solar radiation found in space

## **Pollution Control**

Recently, it has been discovered that gold nanoparticles, measuring only 25 nanometres across, can split oxygen atoms, thereby facilitating oxidation

reactions, which create useful organic products as oxygen atoms and carbon compounds combine. New research published in the top scientific journal Nature has revealed that gold catalysts can clean up an important chemical process that is used routinely to produce tons of pharmaceuticals, detergents and food additives.

As a chemical catalyst, gold plays an important role in new environmental applications, such as pollution control of mercury emissions and in fuel cells. The Institute for Green Technology in Tokyo has 30 scientists currently working on gold catalysts for environmentally sensitive, or "green", technology applications. Some of the potential applications for gold catalysts include:

- Pollution control in diesel-powered vehicles, and in the environment;
- Clean energy generation, by means of fuel cells;
- Sensors, for detecting gases in industrial processes;
- **As catalysts for chemical and petrochemical processes.**

#### **Other Applications**

- Standard touch-tone telephones and cell phones would not function without the 33 electronic contacts made from gold.
- Air bag systems fitted in more than 30 million cars around the world rely on gold-coated electrical contacts.
- Every computer keystroke strikes a gold circuit that relays the command to the computer's microprocessor.
- Use of gold as reflective coatings on windows. Such coatings are used on hotel-casinos in Nevada such as on the Mirage and Mandalay Bay hotels in Las Vegas. This coating, which takes advantage of gold's unique property of reflecting infrared light and heat while transmitting green and blue light, thereby reducing the costs of air conditioning, is only a few atoms thick.