Nanochemistry

Did you know?

About the Scanning Tunnelling Microscope (STM)

The scanning tunnelling microscope (STM) allows scientists to see atoms. It was invented in the 1980s by two physicists called Gerd Binnig (from Germany) and Heinrich Rohrer (from Switzerland) who were working at IBM's Zurich factory. The first pictures of atoms taken with an STM were produced in 1985.

The basic principle uses a probe to scan just above a surface and monitor an electrical current that flows between two conductors set only about one nanometre apart. The probe is usually called the tip as it is a sharp metallic point with the apex essentially a single atom. It is important that the distance between the tip and the surface must be controlled and therefore the microscope is isolated from vibrations.

The current between the tip and the second conductor is called the tunnelling current. This varies depending on the separating distance between the tip and the sample being studied. The images produced are greyscales where the bright spots relate to high current (making the 'hills') and the dark regions are related to low current (making the 'valleys').

There are two ways that the microscope can be operated:

1 The constant height mode, in which the tunnelling current is monitored as the tip is scanned parallel to the surface. This mode is used in spectroscopy to study the electronic properties of the sample.

2 The constant current mode, in which the tunnelling current is kept constant as the tip is scanned across the surface. This mode is more often used, and produces images of the surface contours. In this mode the tip moves slightly higher as it passes over a surface atom and slightly lower as it passes over a hollow. The image is then made by translating the voltage applied to a piezotransducer against the sideways movement of the tip.