

How Is Nanotechnology Used in Radiance Porcelain?

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Nanotechnology has become a catch-phrase for many industries and is one of the most hotly researched technological areas today in electronics, military, medical and materials science. The US Government alone has designated nanotechnology development of strategic importance and has allocated over \$10 billion US for its research and development over the next several years. Scientifically, the term nano means 0.00000001 (10⁻⁹) or something extremely small; for example, sunlight's strongest wavelength is 530 nanometers or the length of a chemical bond between two carbon atoms is 15.4 nanometers. The definition of nanotechnology then has taken on two separate but related definitions. The first is the manipulation of materials on an atomic or molecular lever to build microscopically sized components such as robots or machines. The second definition concerns the use of nano-sized particles to change the bulk characteristics of materials such as strength or physical properties such as color or electrical conductance.

The most familiar use of nanotechnology borders on science fiction where single atoms are manipulated to form tiny machines or robots that can only be seen under relatively high magnification through a microscope. Some of these robots have already found commercial use particularly in the area of electronics; for example, microscopic mirrors that focus light from optical fibers to various locations in telephonic switching stations (**M**icro **E**lectro **M**echanical **S**ystems or MEMS Chips). Others have fabricated microscopic machinery using standard semiconductor electronic fabrication techniques using photolithography and chemical vapor deposition techniques. In fact, many of today's current electronic microprocessors have transistors and other components on the microchip that have nano-sized components.

Another large application of nanotechnology, and one which is growing extensively, is the use of nano-sized particles in material science to create new materials for a wide variety of applications ranging from drug delivery to new materials. In drug delivery, for example, large, cage-like carbon molecules called buckyballs are being evaluated to encapsulate medicines that can be delivered at set times or locations in the body. In material sciences, the incorporation of nano-sized particles are found to change the overall properties of conventional materials such as plastics and ceramics by increasing their optical, electrical or mechanical properties.

Radiance uses nanotechnology in the composition of its dentin modifiers (sometimes called range paste) to drastically increase the chroma and hue of resulting porcelain. Aurident uses nano-sized particles that have extremely high refractive indices and intense coloration. Aurident's nanotechnology materials allow the technician to consistently create realistic outstanding restorations.

For more information on nanotechnology, please click on the following links:

<http://www.zyvex.com/nano/>, <http://www.nano.gov/>, and <http://www.nanoindustries.com/>.

