

Synthetic Ivory

Until recently, no synthetic material has matched ivory in responding to the delicate touch of a concert pianist. Piano keys covered with plastic veneers have been rejected as too slippery and too cool. Eventually, however, a replacement for ivory must be found. In an effort to halt the slaughter of elephants, a global ban on trading in ivory was initiated in 1990 and is reported to be very effective.



A piano keyboard.(V. Holtgrewe)

A team of scientists from Rensselaer Polytechnic Institute has patented a new material that may solve the problem. The essential step in their work was analysis of the surface of natural ivory at the microscopic level by a tribologist, an engineer who studies friction and materials that slide against each other. An ivory surface, they found, is covered with ridges, valleys, and tiny pores. When a sweaty finger slides over such a surface, it alternately sticks and slips, creating the feeling that pianists need for better control. The pores make an important contribution by absorbing sweat and oil from the finger.

To duplicate the ridges and valleys, the scientists worked with a finely made cast of a natural ivory surface. Duplicating the pores was challenging. Ultimately, they developed a synthetic ivory made from a mixture of a liquid polyester, a white titanium pigment, and finely powdered poly(ethylene glycol), a water-soluble polymer. By soaking the material in hot water after it has hardened, the poly(ethylene glycol) is dissolved away, leaving behind pores like those in natural ivory. Their new material has met the ultimate test. Concert pianists have failed to detect a difference between Steinway pianos with keys covered by the new material, known as RPIvory, and natural ivory.

Kotz/Joesten/Wood/Moore: *The Chemical World: Concepts and Applications*, 1/e, p. 597