

313d Very Large Diamonds Produced Very Fast

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Here we report that Carnegie Institution have learned to produce 10-carat, half-inch thick single-crystal diamonds at rapid growth rates (100 micrometers per hour) using a chemical vapor deposition (CVD) process. This size is approximately five times that of commercially available diamonds produced by the standard high-pressure/high-temperature (HPHT) method and other CVD techniques. In addition, the team has made colorless single-crystal diamonds, transparent from the ultraviolet to infrared wavelengths with their CVD process.

Most HPHT synthetic diamond is yellow and most CVD diamond is brown, limiting their optical applications. Colorless diamonds are costly to produce and so far those reported are small. This situation limits general applications of these diamonds as gems, in optics, and in scientific research. Last year, the Carnegie researchers found that HPHT annealing enhances not only the optical properties of some CVD diamond, but also the hardness. Using new techniques, the Carnegie scientists have now produced transparent diamond using a CVD method without HPHT annealing.

To further increase the size of the crystals, the Carnegie researchers grew gem-quality diamonds sequentially on the 6 faces of a substrate diamond plate with the CVD process. By this method, three-dimensional growth of colorless single-crystal diamond in the inch-range (~300 carat) is achievable.