

General Electric's First Diamonds

The first diamonds produced in the General Electric Research laboratory were made on December 16th, 1954 by H. Tracy Hall. Taking a clue from Nature he used Troilite, a non stoichiometric substance that happened to be rich in iron. Troilite had also been found in meteorites that sometimes contained some very microscopic diamonds. With this clue in hand Hall packed his graphite heater tube with iron sulfide and, using his BELT apparatus heated the heater tube and its contents to a temperature around 1600 degrees centigrade while the pressure was, at the same time, at a pressure of about 60 thousand bars.

Then one wintry morning Hall retrieved the pyrophyllite sample cell and the contents of the graphite tube. The tube broke open near the end of one of the tantalum end disks used to bring in the electrical heating current.

He immediately saw dozens of small crystalline diamonds intermixed with unconverted graphite and knew that diamond had at long last been made by man!

At this point, he wrote the following in his research notebook: "My hands began to tremble, my heart beat rapidly, my knees weakened, and no longer gave support" After sitting for awhile and regaining his composure, he examined the crystals. The largest were about 150 microns across and had all the characteristic etch pits and angular corners that he had seen on natural diamonds

The crystals scratched sapphire and had the density and refractive index of diamond. Furthering his investigation, he oxidized the graphite in a hot sulfuric-nitric combination which destroyed the graphite but did not oxidize the diamond. Then he made a solution of calcium chloride. Next, he placed some of the diamond crystals in a hot tube over which the diamond crystals were being burned to carbon dioxide. The carbon dioxide formed was then passed through the calcium chloride solution which formed calcium carbonate.

On the following day, he made twenty more runs in an attempt to determine some optimum values of the variables. He found that iron alone was a catalyst but sulfur was not. Since iron was found to be a group eight catalyst, his colleagues quickly surmised that other group eight metals were also excellent catalysts and they were.

Of the twenty runs that Hall made on the next day (December 17th, a Saturday), twelve of the runs were successful in making diamond. This gave Hall quite a bit of diamond material to play with. The X-ray diffraction photograph was taken on Monday.

December 18th definitely confirmed Hall's previous analytical determinations that he had made diamond. Hall also taught others using his BELT press to make diamonds, including physicist Hugh Woodbury, metallurgist Richard Oriani, and chemists Robert Wentorf and Edward Brady.