Fivefold Twinning of Diamond

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Among the low pressure diamonds grown by acetylene flame, various fivefold twinned particles in a form of pentagonal dipyramid, icosahedron or Kepler-Poinsot's hollow icosahedron were observed[1]. The relations between each twin domains were investigated by the electron back scatter diffraction (EBSD) method. The twin boundaries in the fivefold twins were observed by high voltage high resolution electron microscopy.

In the HRTEM image, one of the fivefold cyclic twin boundaries is different from the others. All four twin boundaries are coherent Ó 3 boundaries where as the other only one is Ó 81 boundary which consists of a series of edge dislocations to make up for the mismatching angles which arise after five successive cyclic twinning. There should be at least six Ó 81 boundaries in a twinned diamond icosahedron.

In the twinned Kepler-Poinsot's hollow icosahedron, the indented negative trigonal faces are formed from {100} faces of cube. The convex edges of the hollow icosahedron could be confirmed as Ó 3 boundaries while the concave edges as Ó 9 boundaries.

[1] Son S. I., Chung S. J., *Z. Krist.,* **219**, 2004, 494.

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