

Diamondoids

Robert William Whitby

5 November 2004

<http://homepage.mac.com/whitby/>

Copyright 2004 by Robert William Whitby

<http://web.me.com/whitby/Octahedron/Welcome.html>

References

1. Octahedron1stEd.pdf The octahedral periodicity of the Atomic Elements and its implications by Robert William Whitby

<http://homepage.mac.com/whitby/FileSharing103.html>

2. Diamond fragments as building blocks of functional nanostructures by Gregory C. McIntosh, Mina Yoon, Savas Berber, and David Tománek, PHYSICAL REVIEW B 70, 045401 (2004)

3. Icosahedral assemblies of triangular panels of diamond CFUs by Robert William Whitby

<http://homepage.mac.com/whitby/Quasicrystals/FileSharing176.html>

4. Polyhedral assemblies of truncated triangular panels of graphite & diamond by Robert William Whitby

<http://homepage.mac.com/whitby/Quasicrystals/FileSharing180.html>

Introduction

This paper has been prompted by Figure 1 of Reference 2 which shows ball-and-stick representations of four “relaxed diamond structures”—adamantane, diamantane, tetramantane, decamantane. The paper describes each ball of each structure as a single C-atom. But, to realize the structures, each ball must be a four C-atom tetrahedron—a diamond CFU.

Each of the four structures is shown in He-octa detail. Each is shown in two separate views—vertexial and facial. The facial views show that each of the assemblies has features which appear in the diamond panels of the fullerenes. [See References 3 and 4.]

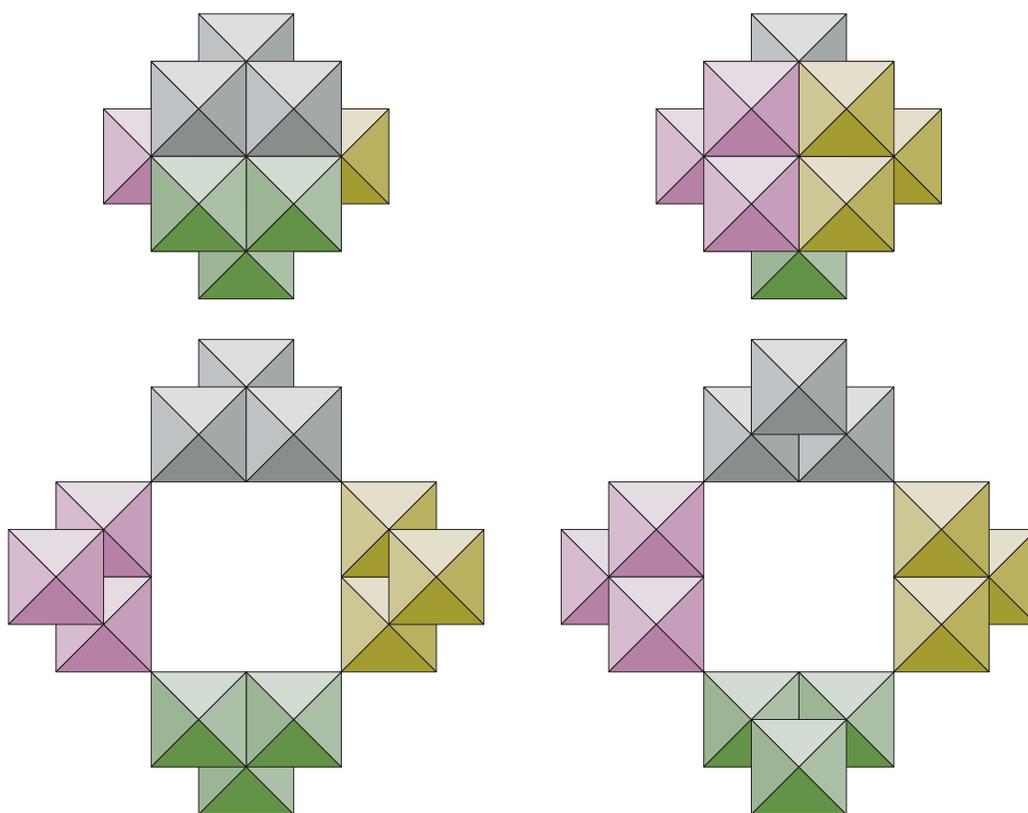
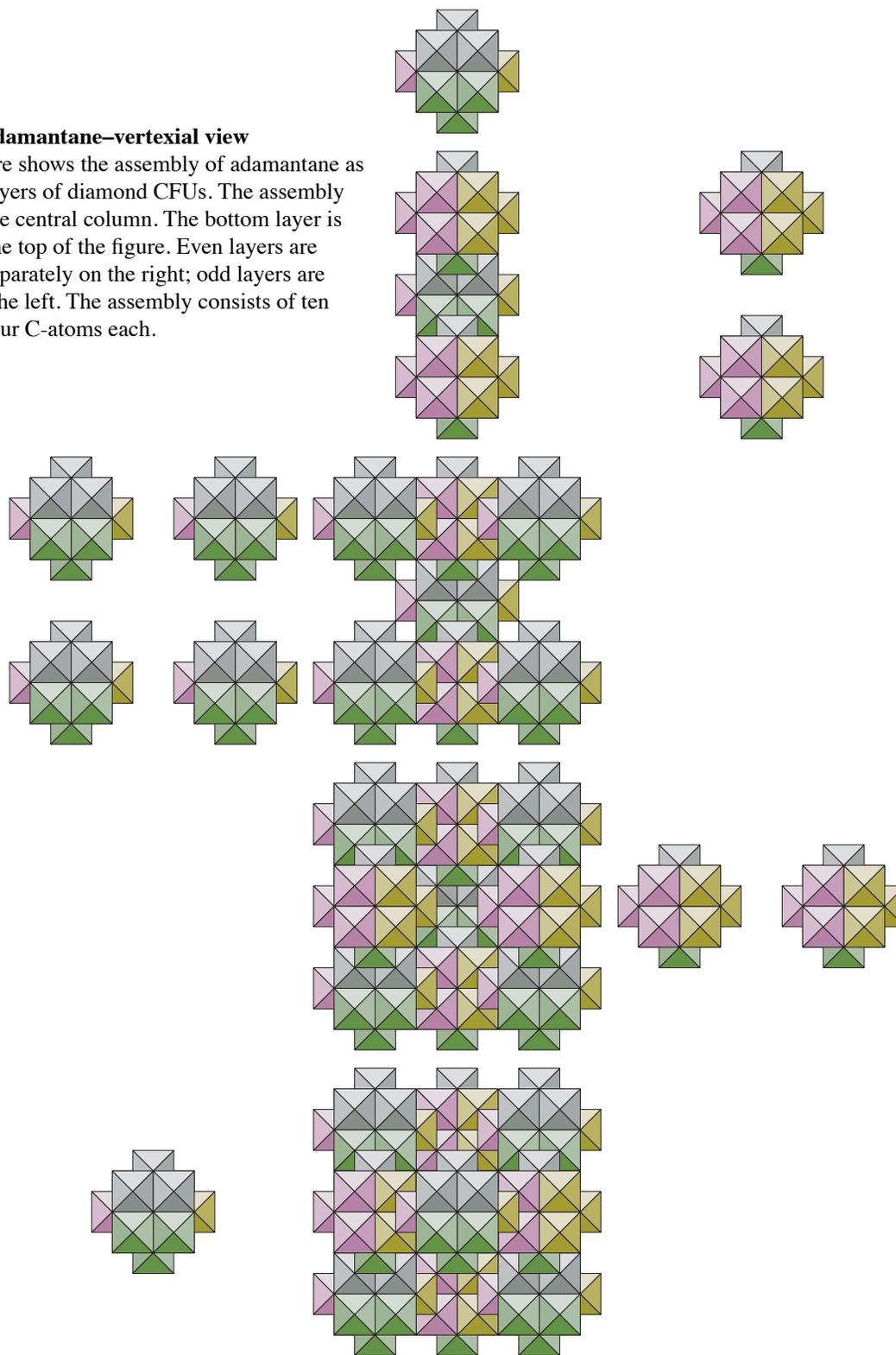


Fig. 1 Diamond CFU–vertexial views

The figure shows two vertexial views of the diamond CFU. Each of the four C-atoms of the diamond CFU has a color which differs from the other three. The view on the left is the obverse of the view on the right. In each view, the CFU is above the set of four C-atoms which compose it.

Fig. 2 Adamantane–vertexial view

The figure shows the assembly of adamantane as vertexial layers of diamond CFUs. The assembly grows in the central column. The bottom layer is shown at the top of the figure. Even layers are depicted separately on the right; odd layers are shown on the left. The assembly consists of ten CFUs of four C-atoms each.



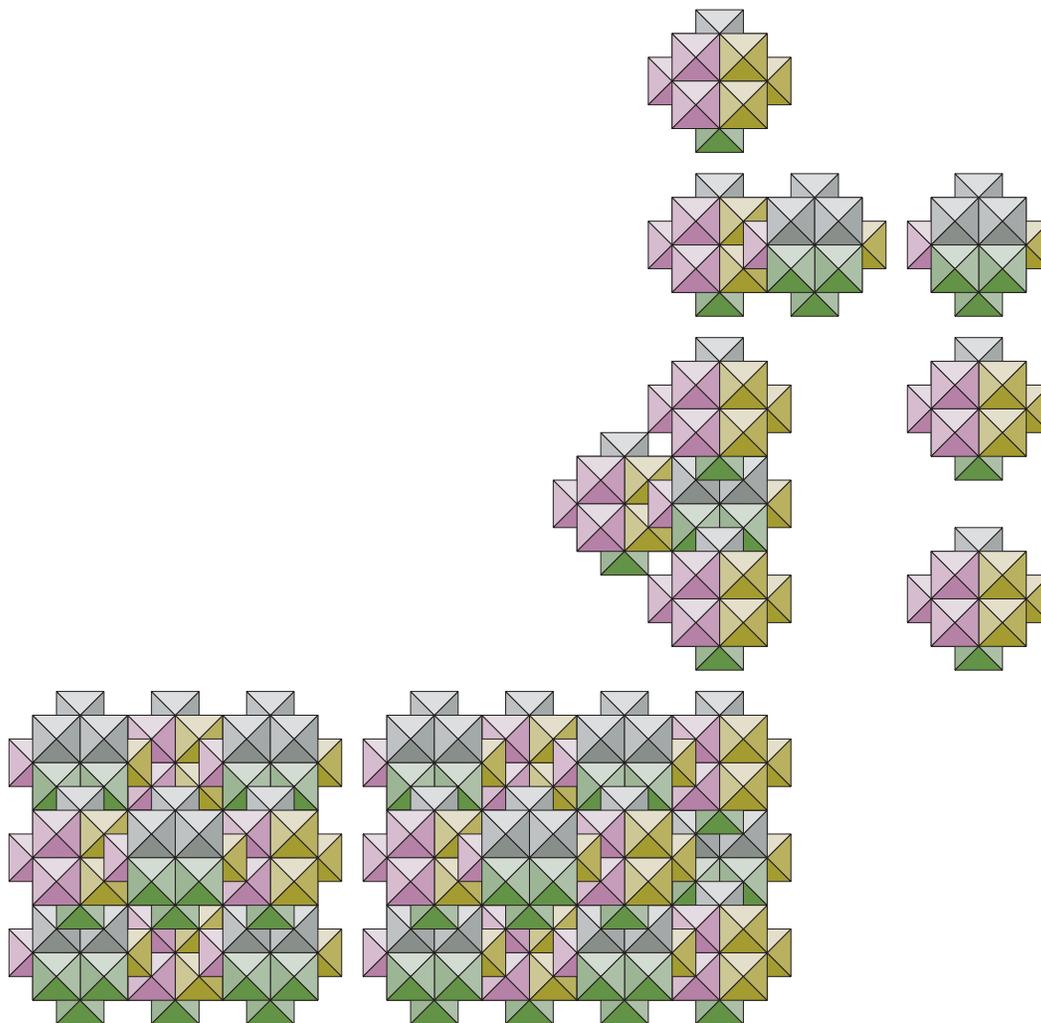


Fig. 3 Diamantane–vertexial view

The figure shows the assembly of diamantane by extending the adamantane assembly of the previous figure. The adamantane assembly is shown on the bottom left. The assembly at the top is a 2-triangle which consists of four diamond CFUs. The assembly occupies the upper left column; its additional layers occupy the upper right column. The complete assembly is on the right of the bottom row. It consists of fourteen diamond CFUs of four C-atoms each.

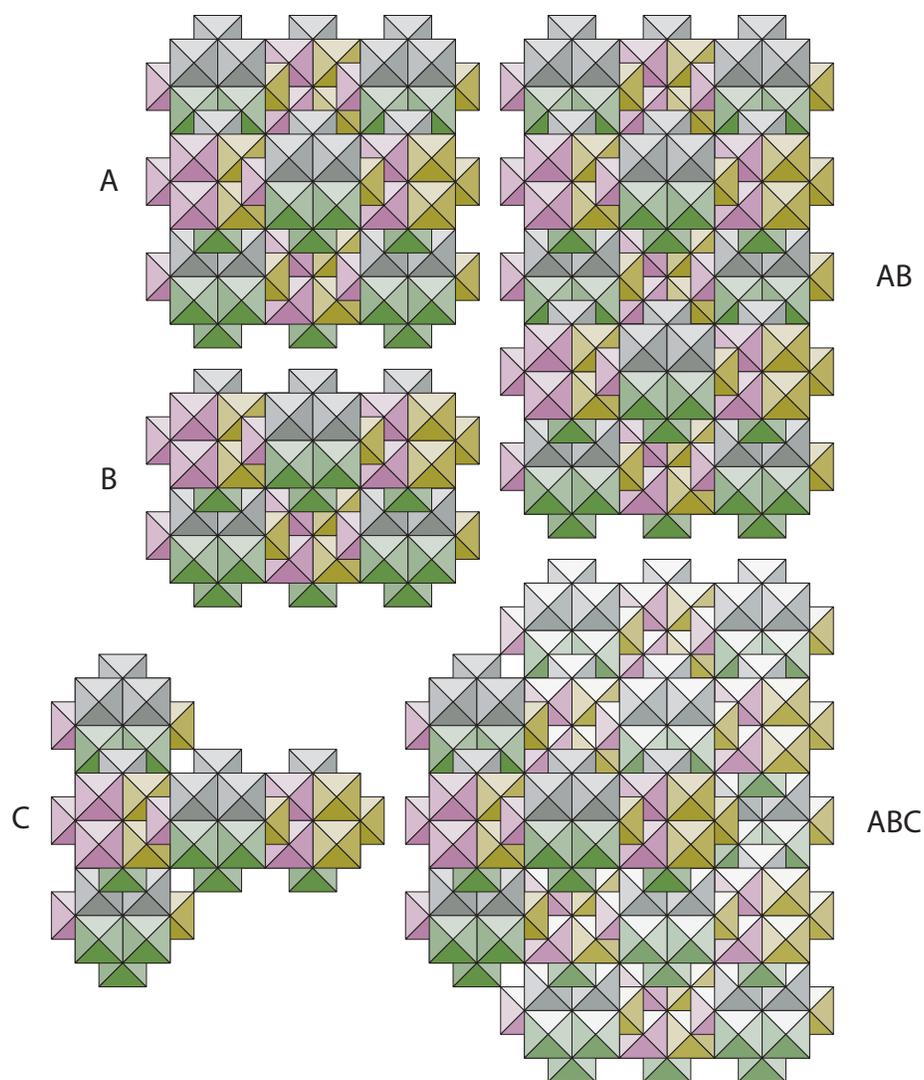


Fig. 4 Tetramantane–vertexial view

The figure shows the assembly of tetramantane by adding additional groups of diamond CFUs to adamantane. The adamantane is shown on the upper left and is labeled A. The assembly marked B consists of seven CFUs. Assembly C consists of five CFUs. The completed tetramantane assembly is shown on the bottom right. It consists of twenty-two diamond CFUs of four C-atoms each.

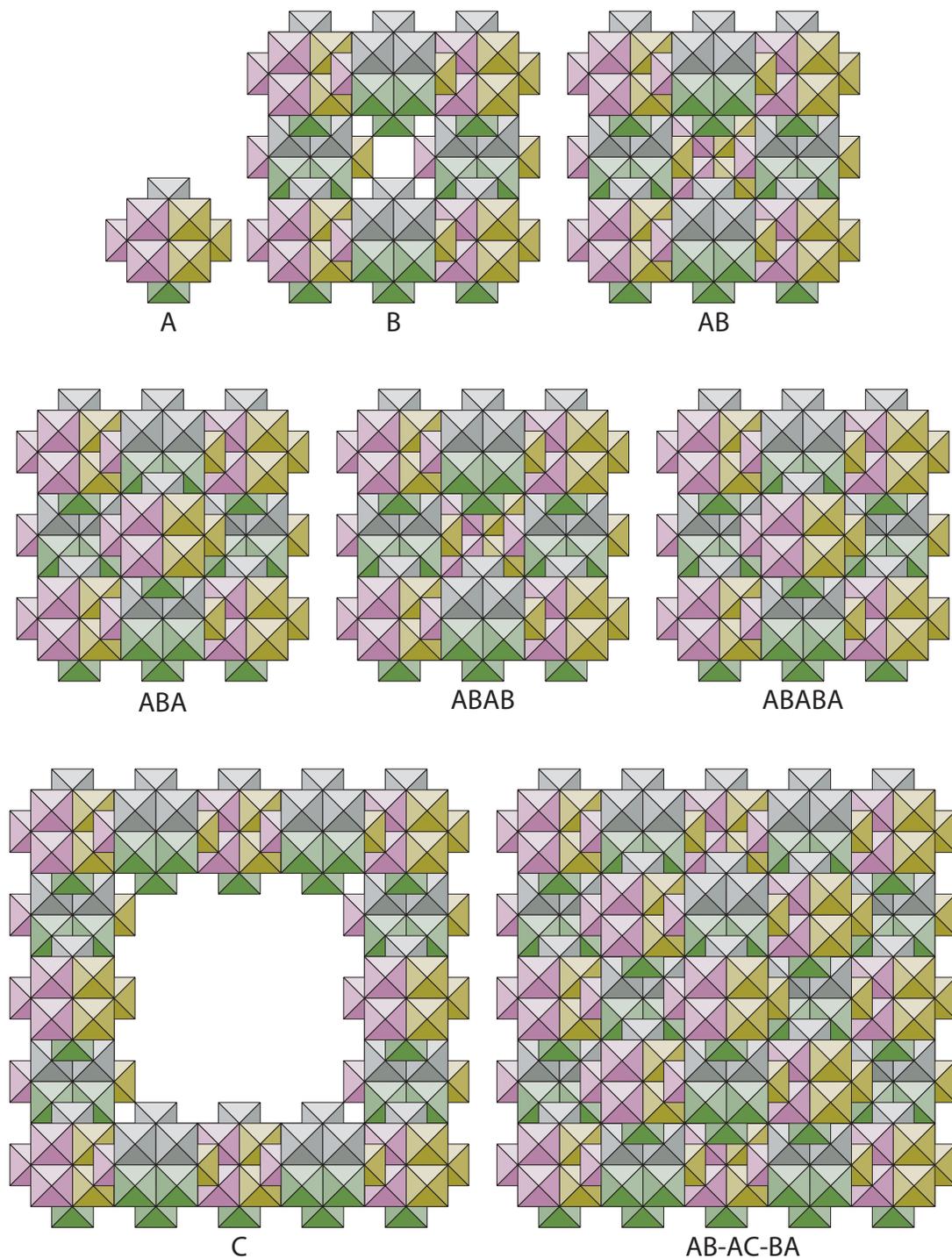


Fig. 5 Decamantane–vertexial view

The figure shows decamantane built up of six pieces. It begins in the upper left with a single CFU. A ring of eight CFUs is added to it. A lone CFU is the next layer. A second ring of eight CFUs is added next to give ABAB. A third lone CFU is added next to give ABABA. An equatorial ring of sixteen CFUs completes the assembly. Decamantane consists of thirty-five diamond CFUs of four C-atoms each.

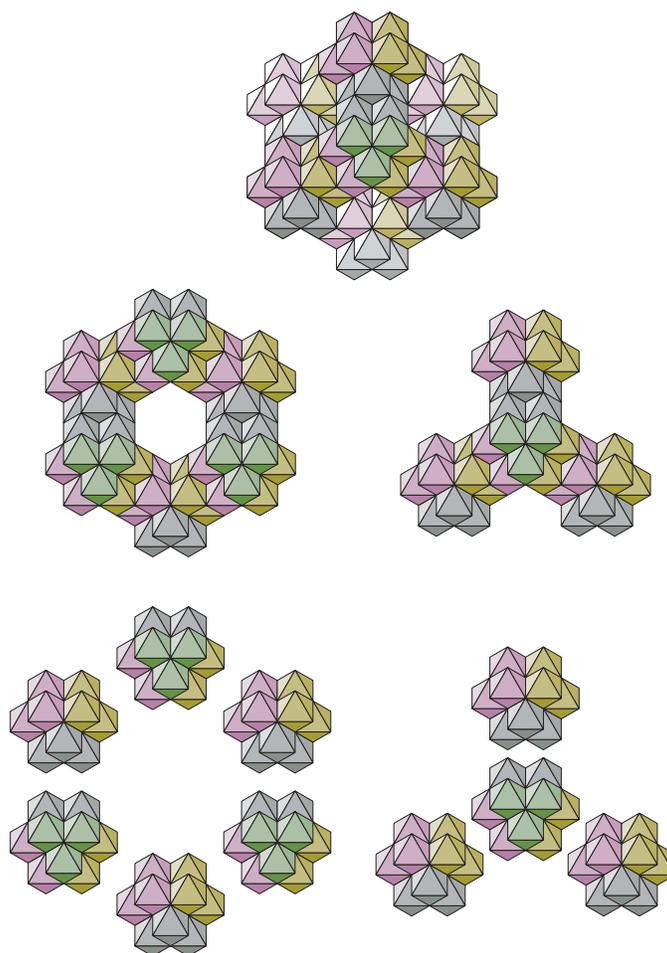


Fig. 6 Adamantane–facial view

The figure shows the assembly of adamantane using facially planar assemblies. The completed assembly is at the top; the two sub-assemblies are in the middle; and the CFUs which make up the sub-assemblies are at the bottom.

The ring of six diamond CFUs is the bottom assembly; the 2-triangle of four diamond CFUs is the top assembly.

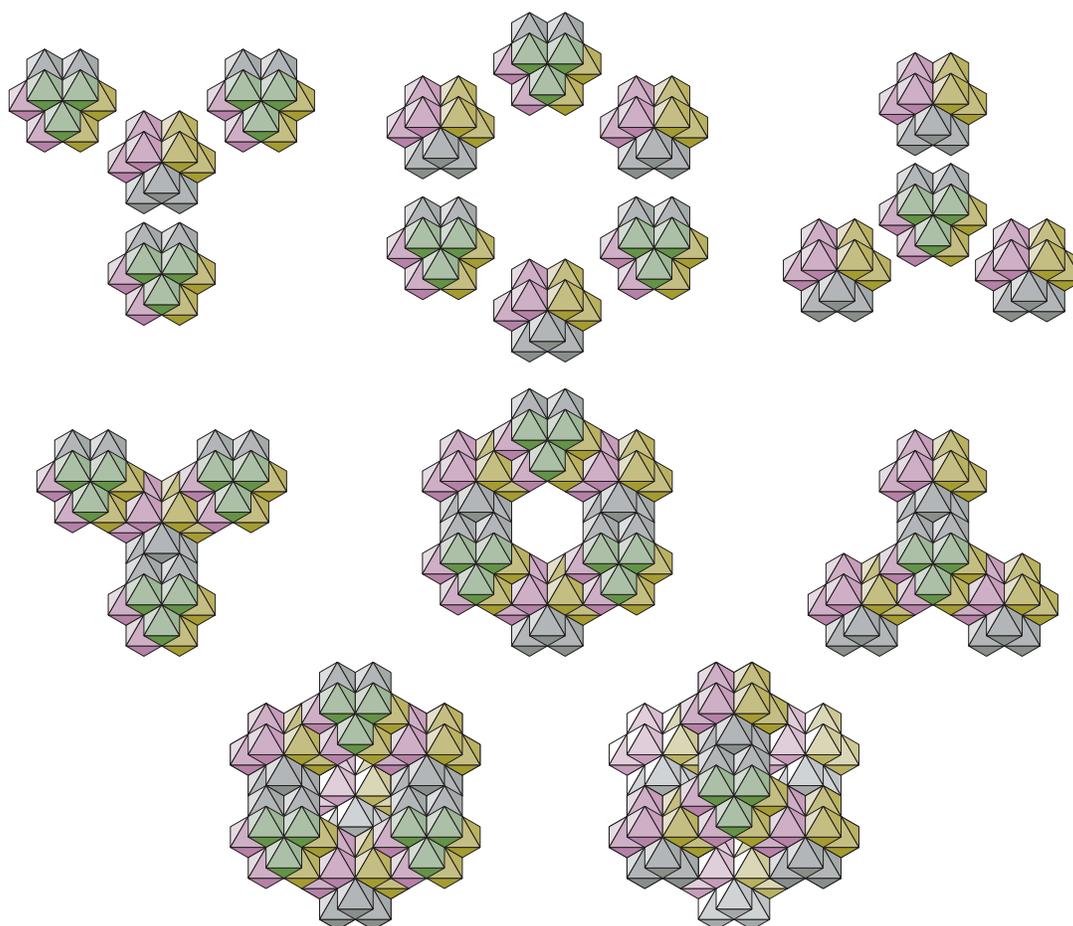


Fig. 7 Diamantane–facial view

The figure shows the assembly of diamantane using three sub-assemblies—an inverted 2-triangle, a ring, a 2-triangle. Each of the sub-assemblies is shown in the middle row. The diamond CFUs which compose each of the assemblies are in the top row. The ring joins to the inverted 2-triangle in the first step of the assembly which is shown in the bottom left. The 2-triangle completes the assembly on the bottom right.

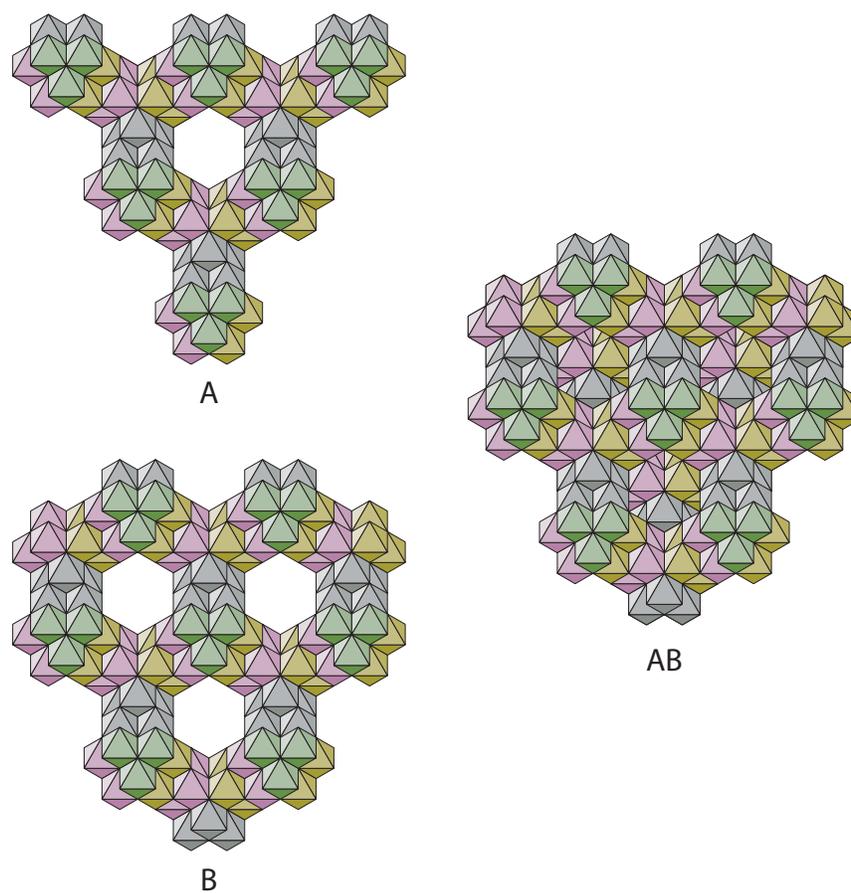


Fig. 8 Tetramantane–facial view

The figure shows how tetramantane can be formed from two diamond layers which are found in fullerenes—a 3-triangle and a vertexially truncated 4-triangle. [See References 3 and 4.] The 3-triangle is the bottom assembly; the truncated 4-triangle is the top assembly. The complete tetramantane assembly is shown on the right.

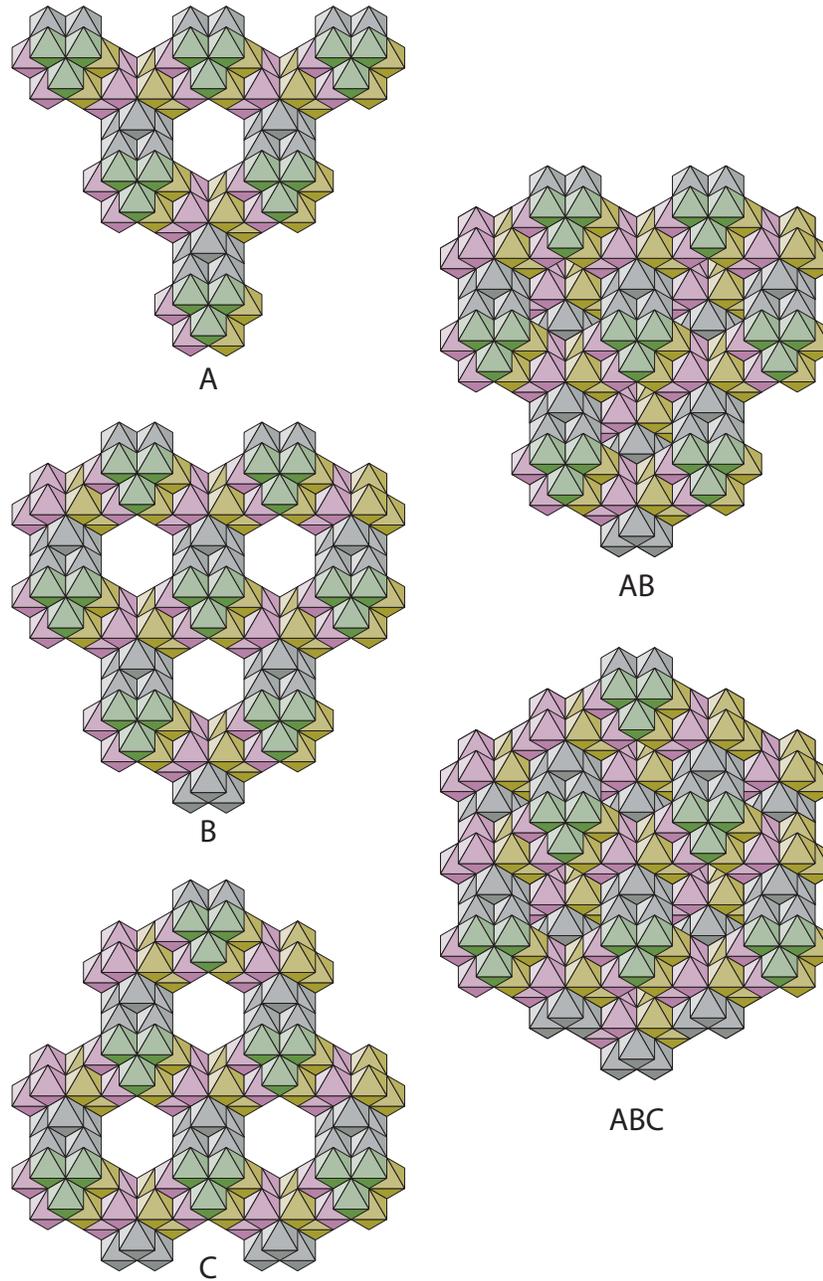


Fig. 9 Decamantane–facial view

The figure shows how decamantane can be assembled from three sub-assemblies—3-triangle, truncated 4-triangle, inverted truncated 4-triangle. The truncated 4-triangle marked B is joined to the 3-triangle marked A to make the sub-assembly AB. The truncated 4-triangle marked C joins to the top of AB to make the decamantane assembly marked ABC.