Tubular assemblies of fivefold rings of diamond CFUs

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

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References

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2. GraphitePanels.pdf Triangular panels composed of graphite CFUs

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http://homepage.mac.com/whitby/Quasicrystals/FileSharing75.html

Introduction

This file shows how rings of diamond CFUs can join to form pentagonal and decagonal cylindrical assemblies.

Figure 1 shows how a sheet of hinge joined diamond CFUs can roll into an unstable tenfold cylinder.

Figures 2 and 3 show how unstable rings of icosahedrally oriented diamond CFUs can join together as a stable assembly.

Figure 4 shows how a ring of five icosahedrally oriented diamond CFUs can be linked by additional CFUs to a ring of ten hinged diamond CFUs to form a stable assembly.

Figure 5 shows how additional hinged decagonal rings can join with the previous assembly to form a tubular assembly.

Figure 6 shows a model in which a ring of five hinged panels is joined to a ring of ten hinged panels by additional panels to form a stable assembly. Five octahedral panels cannot form a hinged ring. But the mutual stablilization of a hinged ring and an icosahedral ring is effected in the same manner.

Figure 7 shows a layout for producing the model shown in the previous figure.

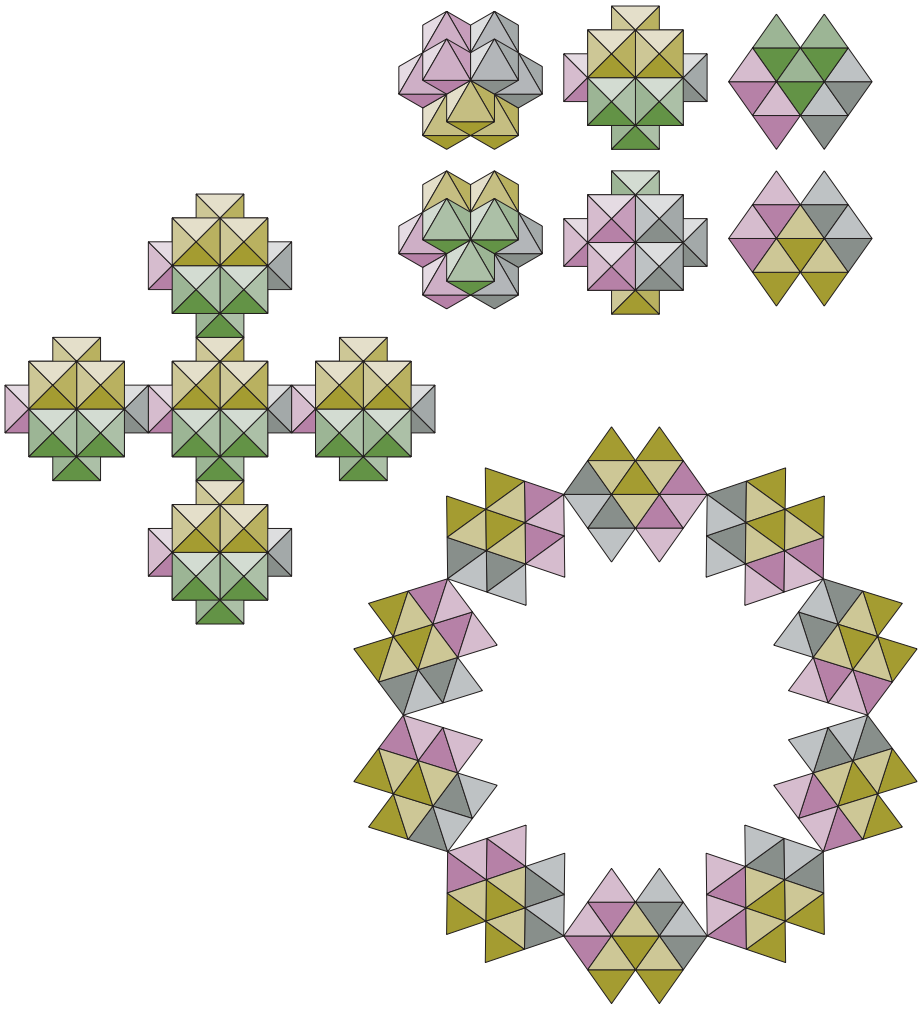

Fig. 1 Tubular assembly of diamond CFUs

The figure shows how diamond assemblies can make tubular assemblies.

At the top right, a diamond CFU is shown in facial, vertexial and edgial views. Each view is shown with its obverse.

At the left, four CFUs are joined to a central CFU. Each is connected with the other by a He-octa edge. A rectangular sheet of diamond CFUs whose width is six or more units can form a tube with the units of the width acting as the circumferential units and the units of the length acting as the longitudinal units.

At the bottom right, there is an axial view of a tubular assembly having ten diamond CFUs hinge joined about its circumference.

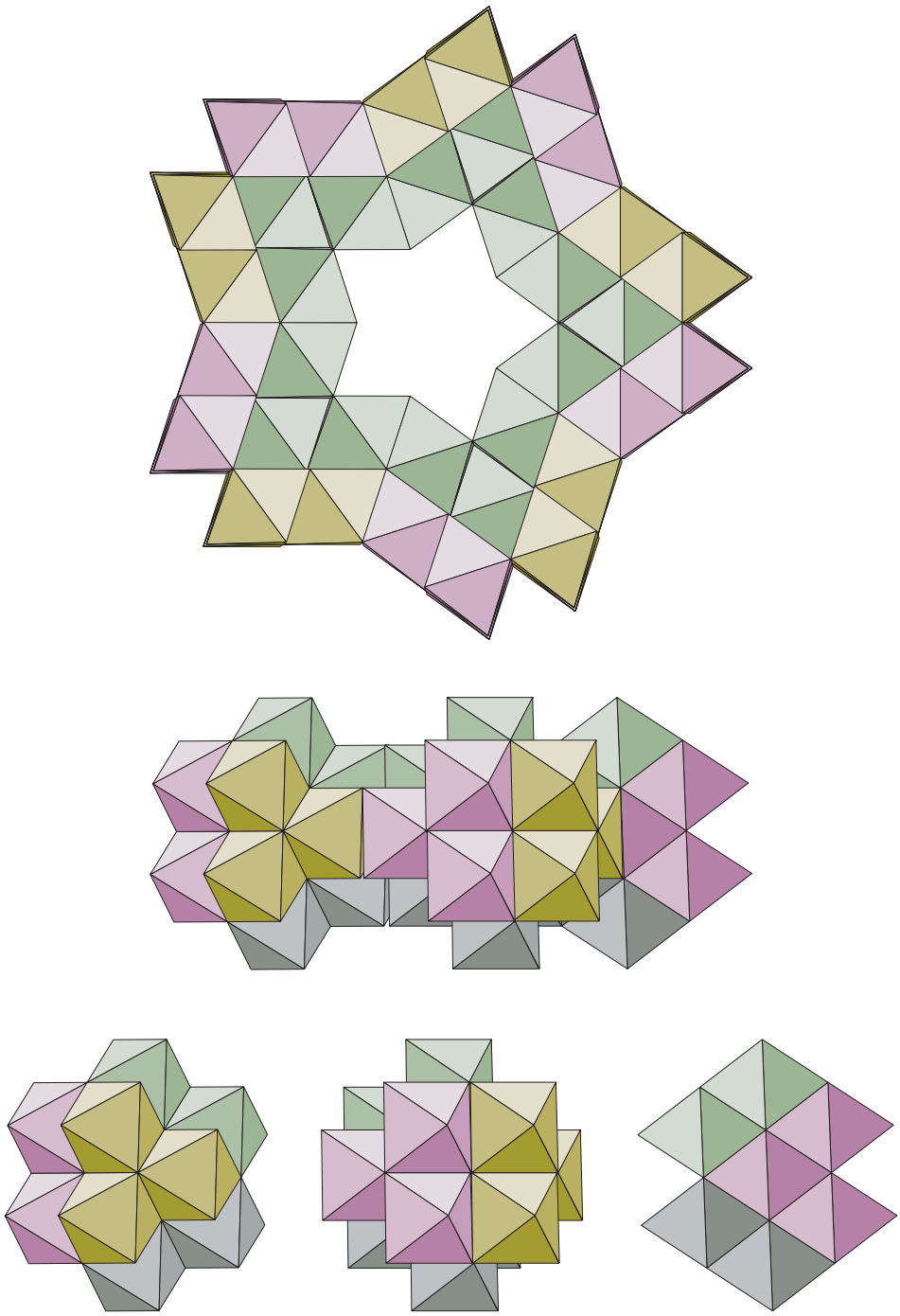

Fig. 2 Ring of diamond CFUs at an icosahedral vertex

At top, a ring of five diamond CFUs is shown in a view from the icosahedral centroid and parallel to the axis of the fivefold ring symmetry.

In the middle, the ring view is normal to its axis of symmetry.

At bottom, the visible CFUs are shown separately from the ring.

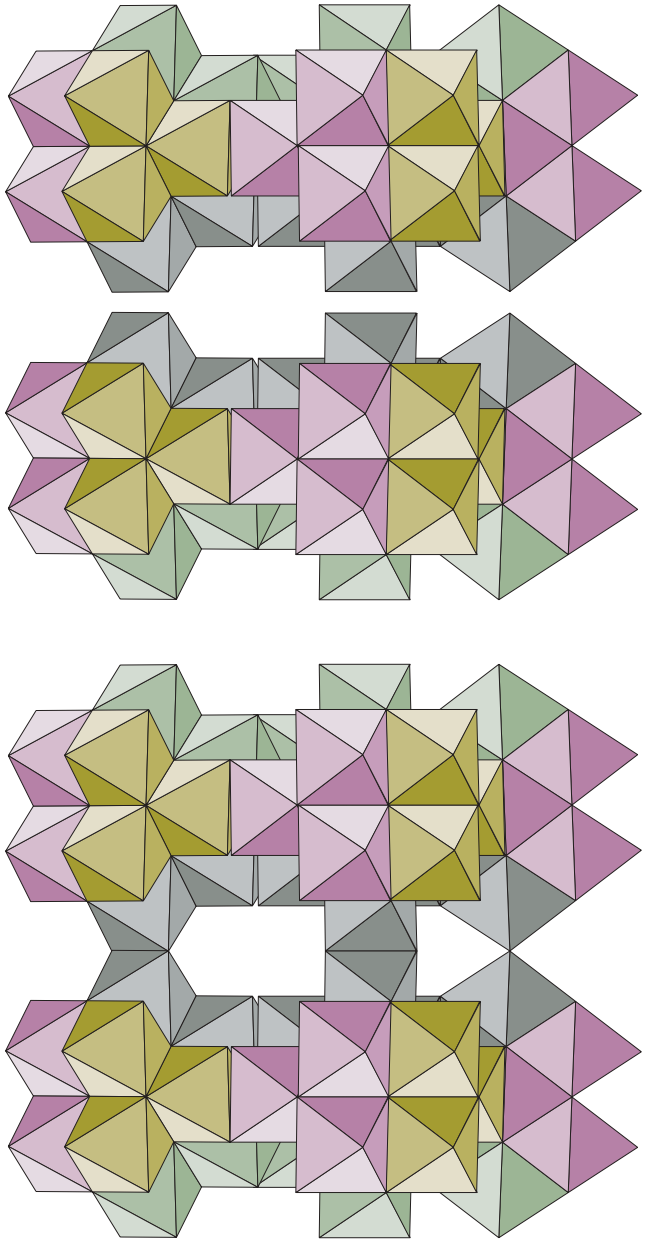

Fig. 3 Structural stacking of icosahedral rings of diamond CFUs

At top, two identical icosahedral vertexial rings of diamond CFUs are shown which differ by a half turn rotation about the bottom of the page.

At bottom, the two rings are joined as a stable structural unit. A He-octa edge of each gray colored C-atom of one ring is joined to a He-octa edge of a gray C-atom of the other ring.

The stack can be axially extended by the joining of a third ring at top or bottom. A He-octa edge of each green C-atom of the added ring will be joined to a He-octa edge of each green C-atom of the stack ring. The rings must join either gray to gray or green to green because the ring of five green edges does not coincide with the ring of five gray edges.

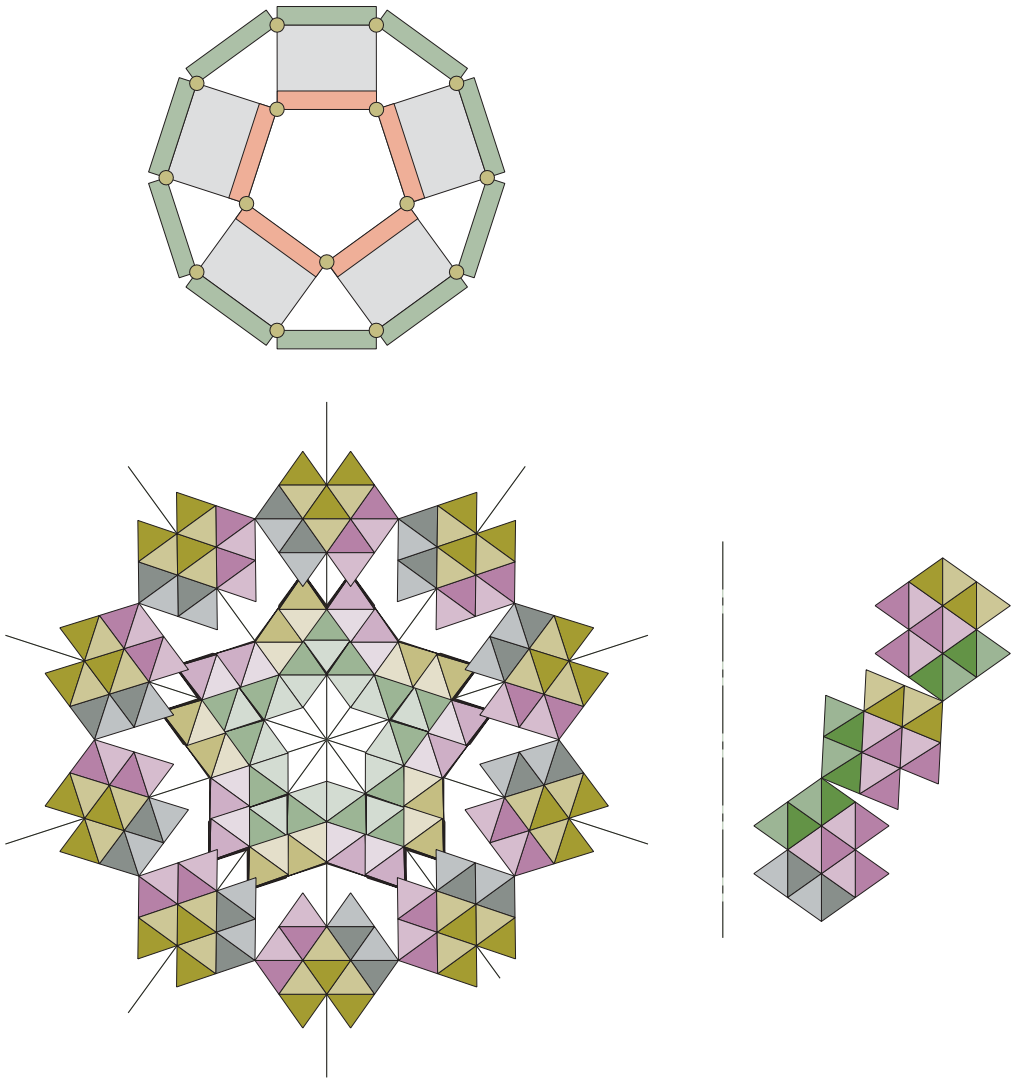

Fig. 4 Diamond CFUs–joining a fivefold icosahedral ring with a tenfold hinged ring

At bottom left, an icosahedral ring of five diamond CFUs is axially concentric with a hinged ring of ten diamond CFUs. Neither ring is structurally stable by itself. But, when they are hinge linked by five additional diamond CFUs, the assembly is structurally stable.

At bottom right, three diamond CFUs are hinge joined. The bottom CFU belongs to the pentagonal ring, the top CFU belongs to the decagonal ring, and the middle CFU is hinge joined to the other two. The geometrical relationship of the three CFUs to the axis of symmetry of the assembly is shown.

At top left, each CFU of the pentagonal ring is represented by a red rectangle; each CFU of the decagonal ring is represented by a green rectangle; and each linking CFU is represented by a gray rectangle. The yellow circles indicate the locations of the hinged join between the CFUs of each ring. The hinges of the decagonal ring are parallel; the hinges of the pentagonal ring are not.

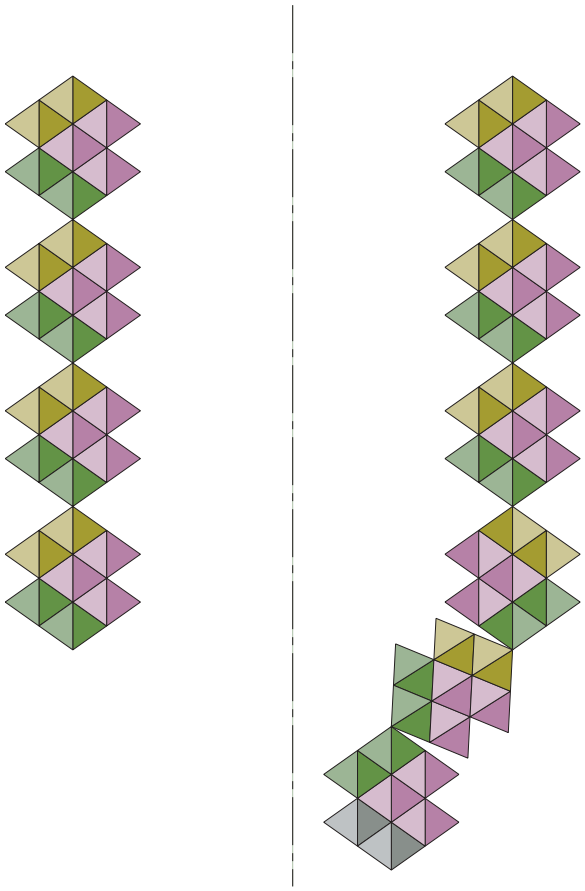

Fig. 5 Decagonal tube of diamond CFUs

The stabilized decagonal ring of diamond CFUs may be joined by additional decagonal rings to form a decagonal tube. There is a hinge join between the CFUs of adjacent rings. The figure shows three additional decagonal rings joined to the stabilized decagonal ring. The axis of the tube is shown by the dashed line. Only one set of diametrically opposed CFUs is shown.

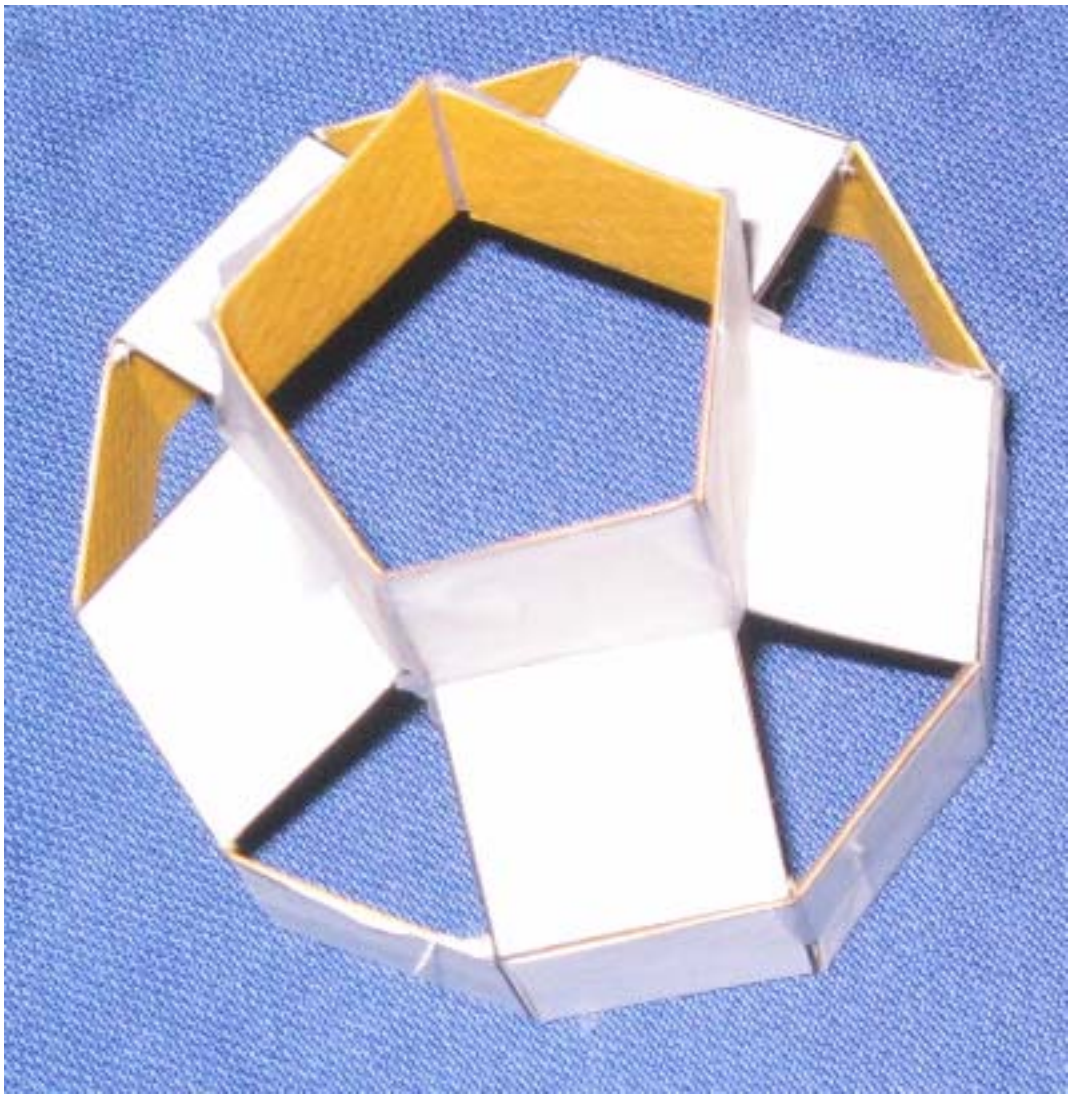

Fig. 6 Model of a pentagonal ring and a decagonal ring linked by identical panels

The figure shows a model made of heavy paper which shows that a stable assembly results from the joining of a pentagonal hinged ring with a decagonal hinged ring using identical panels throughout. The hinge joins of the pentagonal ring are parallel to the hinge joins of the decagonal ring. The linking panels stabilize both rings resulting in structural stability.

Fig. 7 Layout for stabilized assembly of linked pentagonal and decagonal rings
The figure is a layout of a twenty panel assembly which folds up into an assembly consisting of a pentagonal ring linked to a decagonal ring by five panels.