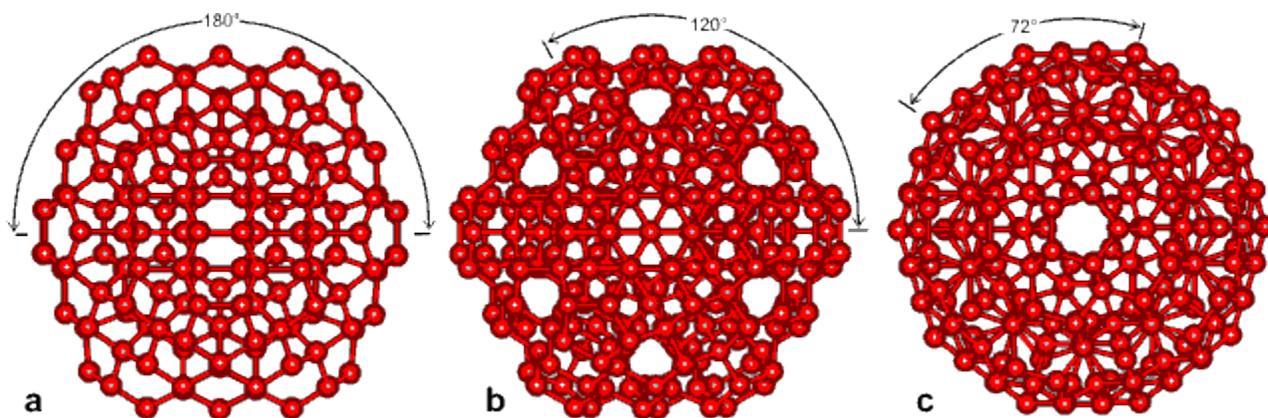


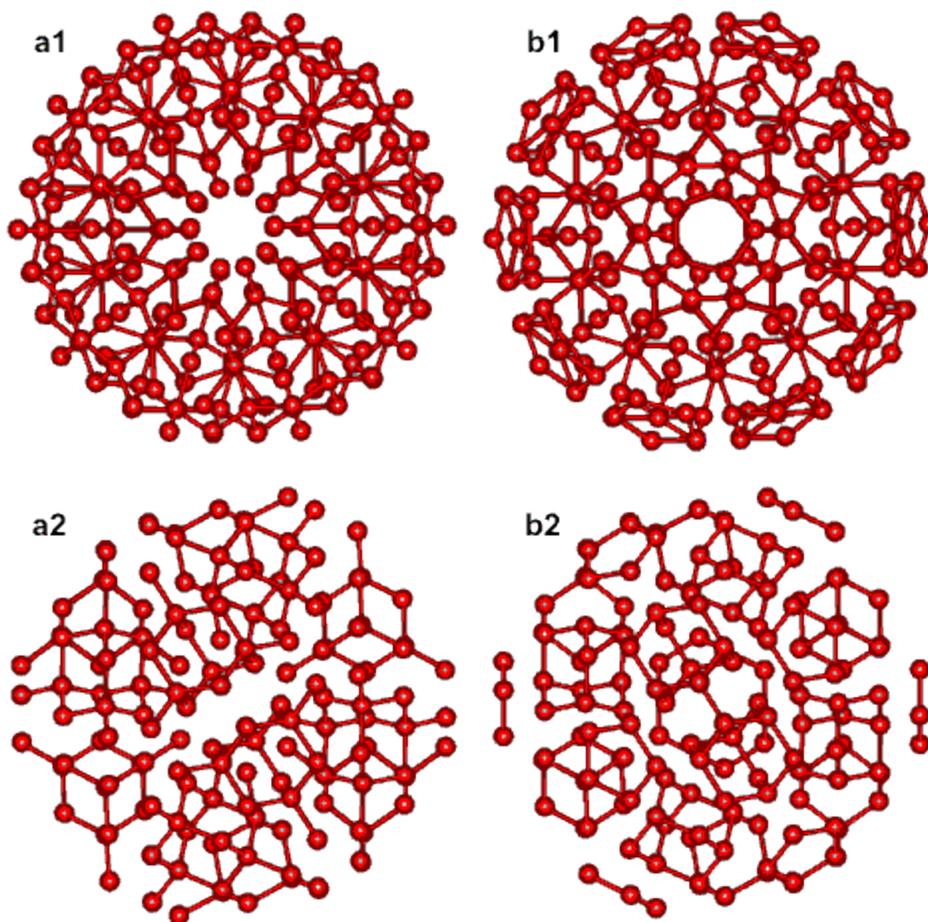
Icosahedral Water Cluster Architecture

The [ES](#) structure consists of a 280-water-molecule cluster with [icosahedral](#) (I_h) symmetry, one of the highest symmetries possible in nature with a surface similar to the faces of an 'expanded' [small rhombicosidodecahedron](#) (with 12 regular pentagons, 20 regular triangles and 30 rectangles as faces).

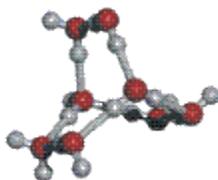


Above are shown representative views of one of the 15 two-fold rotation axes (C_2 , **a**), one of the 10 three-fold rotation axes (C_3 , **b**) and one of the 6 five-fold rotation axes (C_5 , **c**); only the oxygen atoms of the constituent water molecules are shown (for interactive structures, see [Jmol](#)).

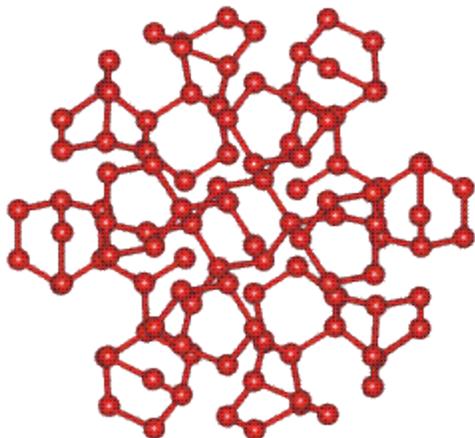
The [icosahedral water cluster](#) as made up from [14-water-molecule water tetrahedra](#) (**a1** and **a2**) or from water [cyclic pentamers](#) and [tricyclo-decamers](#) (**b1** and **b2**).



a1 and **b1** are shown orthogonal to **a2** and **b2** respectively. Only the oxygen atoms of the constituent water molecules are shown. Hydrogen bonds within the structures are shown but hydrogen bonding between structures are not shown. For interactive Figures, see [Jmol](#).



Eight water molecules may cluster by hydrogen bonding to form bicyclo-octamers (paddle-like). The hydrogen bonding arrangements are random within the restraints of [hydrogen bonding](#).



These clusters are highly symmetrical, having one axis of three-fold symmetry C_3 and three axes of two-fold symmetry C_2 . They are therefore particularly favored clusters. The [icosahedral water cluster](#) may be considered as being made up completely from such bicyclo-octameric water clusters. All the water molecules may be part of three such clusters. In order to see some of these more clearly, 64 of the 280 water molecules have been removed from the water icosahedron. Only the oxygen atoms of the constituent water molecules are shown. Hydrogen bonds within the structures are shown but hydrogen bonding between structures are not shown.

For interactive Figures, see [Jmol](#).

Source : <http://www1.lsbu.ac.uk/water/icosahedra.html>