Crystal Structure of Bis(triethylammonium)closo-decahydrodecaborate, 
\[\text{[(C}_2\text{H}_5)_3\text{NH}]_2[\text{B}_{10}\text{H}_{10}]\]

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\(\text{closo-Decahydrodecaborate(2-), Cage Symmetry}\)

The crystal structure of bis(triethylammonium)closo-decahydrodecaborate [bis(triethylammonium)decaboranate(10)], \[\text{[(C}_2\text{H}_5)_3\text{NH}]_2[\text{B}_{10}\text{H}_{10}]\], was determined and refined (space group \(P_{mmm}\), no. 59, \(a = 989.7\,\text{pm}, b = 1333.7\,\text{pm}, c = 903.7\,\text{pm}\)). The compound is a versatile starting material for many substances containing the \[\text{[B}_{10}\text{H}_{10}]^{2-}\] entity and its derivatives. The \(\text{closo-}[\text{B}_{10}\text{H}_{10}]^{2-}\) cluster is a bicapped square antiprism which is only slightly distorted. Its deviation from \(\text{D}_{4d}\) symmetry is smaller than that of the \(\text{B}_{10}\) cages in every other compound containing this entity that have been structurally characterised. The presence of additional (N)H---B\(_3\) interactions in form of multiple-centre bonds between the cations and the anions, which were postulated earlier and which should influence the cage symmetry, could not be confirmed. At 55 °C, the transition into a high temperature phase was investigated by X-ray powder diffraction. The high temperature phase crystallises in the tetragonal crystal system \(a = 946.9\,\text{pm}, c = 1351.0\,\text{pm}\).