

Euclidean group and its subgroups

All possible symmetry operations (space groups) in a crystal can be composed of symmetry operations from the translation group T and one of the so-called crystallographic point groups.

- Define the following terms within the context of crystallography: symmetry operation, symmetry element, symmetry group
- What is the Euclidean group $E(n)$ and how is it related to the orthogonal group $O(n)$?
- Give examples for elements of the rotation group $SO(3) = O^+(3)$ and the inversion group C_i (a. k. a. cyclic group of order 2, C_2). Determine their determinant. Fill the Cayley table for C_i . Show that both symmetry operations commute.

- What are improper rotations? What is the difference between a roto-inversion and a roto-reflection? Proof that they can be converted into each other. What about their determinant?