

Crystallographic analysis of ground and space thermostable T1 lipase crystal obtained via counter diffusion method approach

ABSTRACT

Three-dimensional structure of thermostable lipase is much sought after nowadays as it is important for industrial application mainly found in the food, detergent, and pharmaceutical sectors. Crystallization utilizing the counter diffusion method in space was performed with the aim to obtain high resolution diffracting crystals with better internal order to improve the accuracy of the structure. Thermostable T1 lipase enzyme has been crystallized in laboratory on earth and also under microgravity condition aboard Progress spacecraft to the ISS in collaboration with JAXA (Japanese Aerospace Exploration Agency). This study is conducted with the aims of improving crystal packing and structure resolution. The diffraction data set for ground grown crystal was collected to 1.3 Å resolution and belonged to monoclinic C2 space group with unit cell parameters $a = 117.40 \text{ \AA}$, $b = 80.95 \text{ \AA}$, and $c = 99.81 \text{ \AA}$, whereas the diffraction data set for space grown crystal was collected to 1.1 Å resolution and belonged to monoclinic C2 space group with unit cell parameters $a = 117.31 \text{ \AA}$, $b = 80.85 \text{ \AA}$, and $c = 99.81 \text{ \AA}$. The major difference between the two crystal growth systems is the lack of convection and sedimentation in microgravity environment resulted in the growth of much higher quality crystals of T1 lipase.

Keyword: Thermostable lipase; Thermostable T1 lipase; Crystallization; Crystallography; Diffusion; Enzyme stability