

The diagram illustrates a photocatalytic cycle for nitrogen fixation. A microorganism, represented by an orange bean-like shape with red wavy lines (flagella) and a blue internal structure, is shown on the left. A red laser beam is directed at a molecule of N_2OR (nitrogenase reductase) located near the microorganism. This molecule is shown in a transition state, with a red arrow indicating the movement of electrons. The cycle then proceeds to the right, where a molecule of N_2O (nitrous oxide) is shown. A yellow arrow indicates the flow of electrons from the N_2OR molecule to the N_2O molecule. Finally, the cycle completes by producing H_2O (water) and N_2 (nitrogen gas), which are shown as separate molecules on the right.

Many bacteria can metabolize N_2O with an enzyme called nitrous oxide reductase (N_2OR)

Details of N₂O reduction by the N₂OR enzyme active site are unclear

Synthetic CuZ model cluster for computationally modeling reaction mechanism and measuring electron distribution spectroscopically

Cooperative activation of N_2O across a Cu/S cluster edge

Knowing the chemical details of N_2OR has the potential to give rise to agricultural technologies that enhance the activity of natural N_2O -fixing bacteria