**C:\Users\Zhou xiaobing\Desktop\s1.tif**

**S1 Fig.** Linear regression between ln(N2 fixation rate) (A) and ln (AO rate) (B) with 1/T based on the Arrenius equation. GB-Dark: Dark BSCs of the Great Basin; GB-Light: Light BSCs of the Great Basin; CH-Lichen: Lichen BSCs of the Chihuahuan Desert; CH-Light: Light BSCs of the Chihuahuan Desert. Only the portion of dataset where the rates increase with T was used.