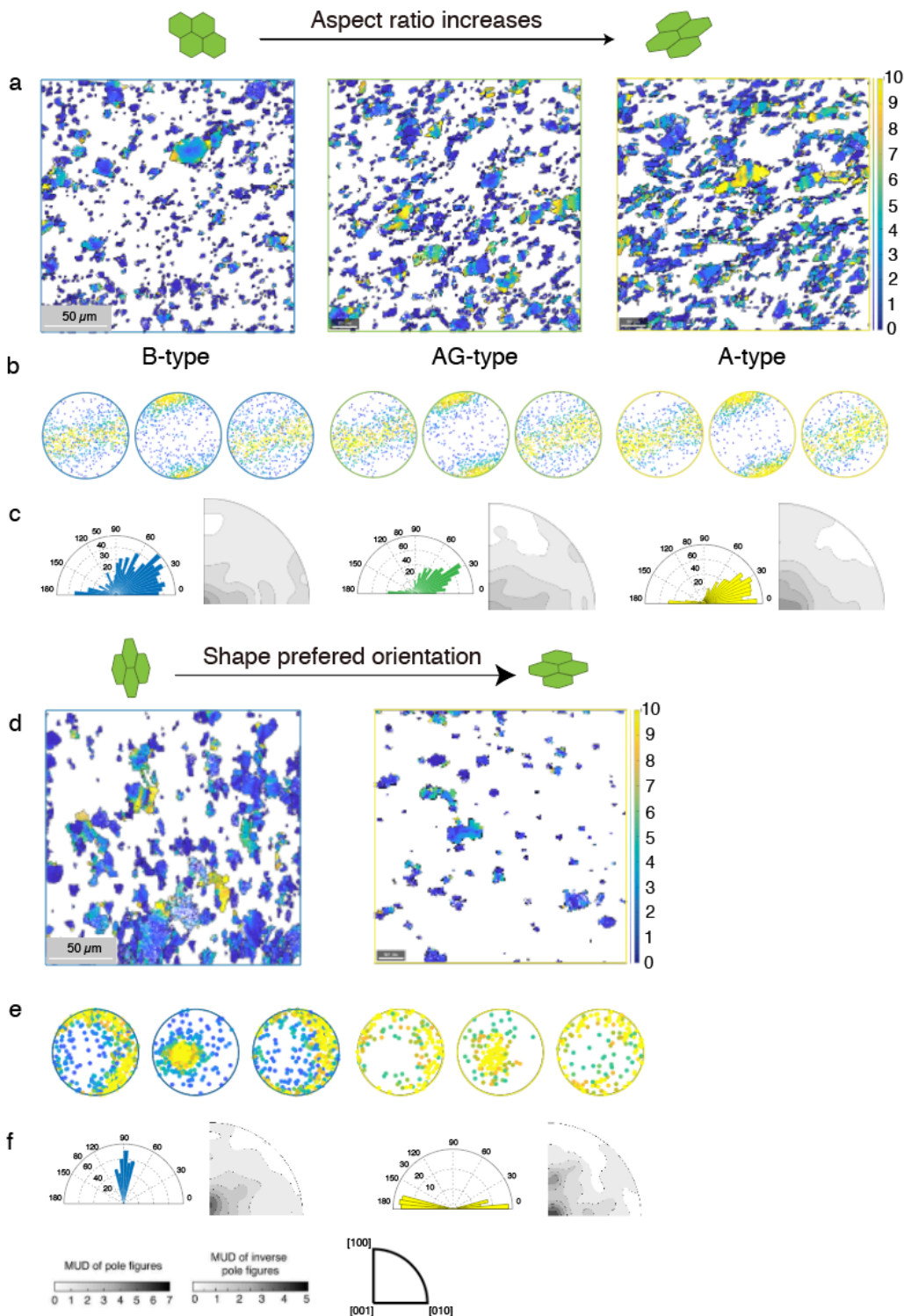


Supplementary Figure 3. A backscattered electron image of a CO<sub>2</sub>-free dunite sample (W2271).



Supplementary Figure 4. EBSD maps and microstructural analyses of 7 vol% CO<sub>2</sub> stepping strain sample (W2263). a, b, and c, the XZ plane section. d, e, and f, the shear plane section. g, a schematic figure of XZ plane and shear plane section (model according Figure 4). Grains in the map are sorted according to either aspect ratios (XZ plane section; from left to right, the aspect ratio of grains increases.) or shape preferred orientations (shear plane section; long axes of grains are either parallel to shear direction or perpendicular to

the shear direction). The color of each pixel inside grain maps represents the misorientation between each pixel and the mean orientation of the grain that the pixel belongs to. Pole figures are equal area, upper-hemisphere projection of olivine crystal axes, and the color scale indicates the multiples of a uniform distribution (MUD).