

FIG. 1. Bond length distribution for alkali and alkali-earth elements. The coordination environments are colored as shown in the inset. To distinguish similar colors for some coordination environments (CEs), pay attention to the staking orders; we use the staking order in the inset. The bond lengths calculated from Shannon's crystal radius are plotted together, specified by arrows whereas numbers in the box show coordination numbers.

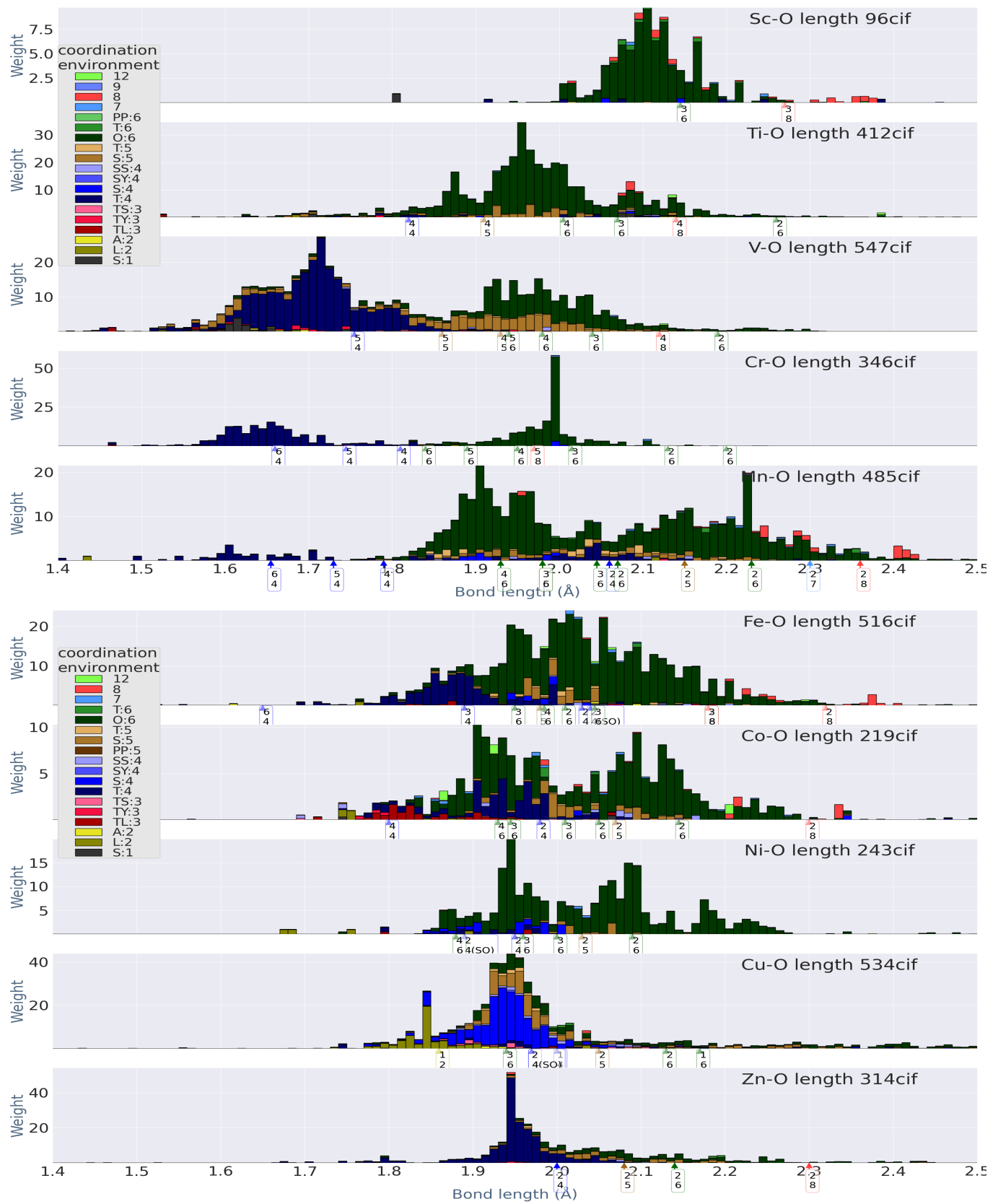


FIG. 2. Bond length distribution for 3d transition-metal elements. See text in Fig.???. Two numbers below arrows in the box; upper numbers for coordination numbers, lower for ionic valency.

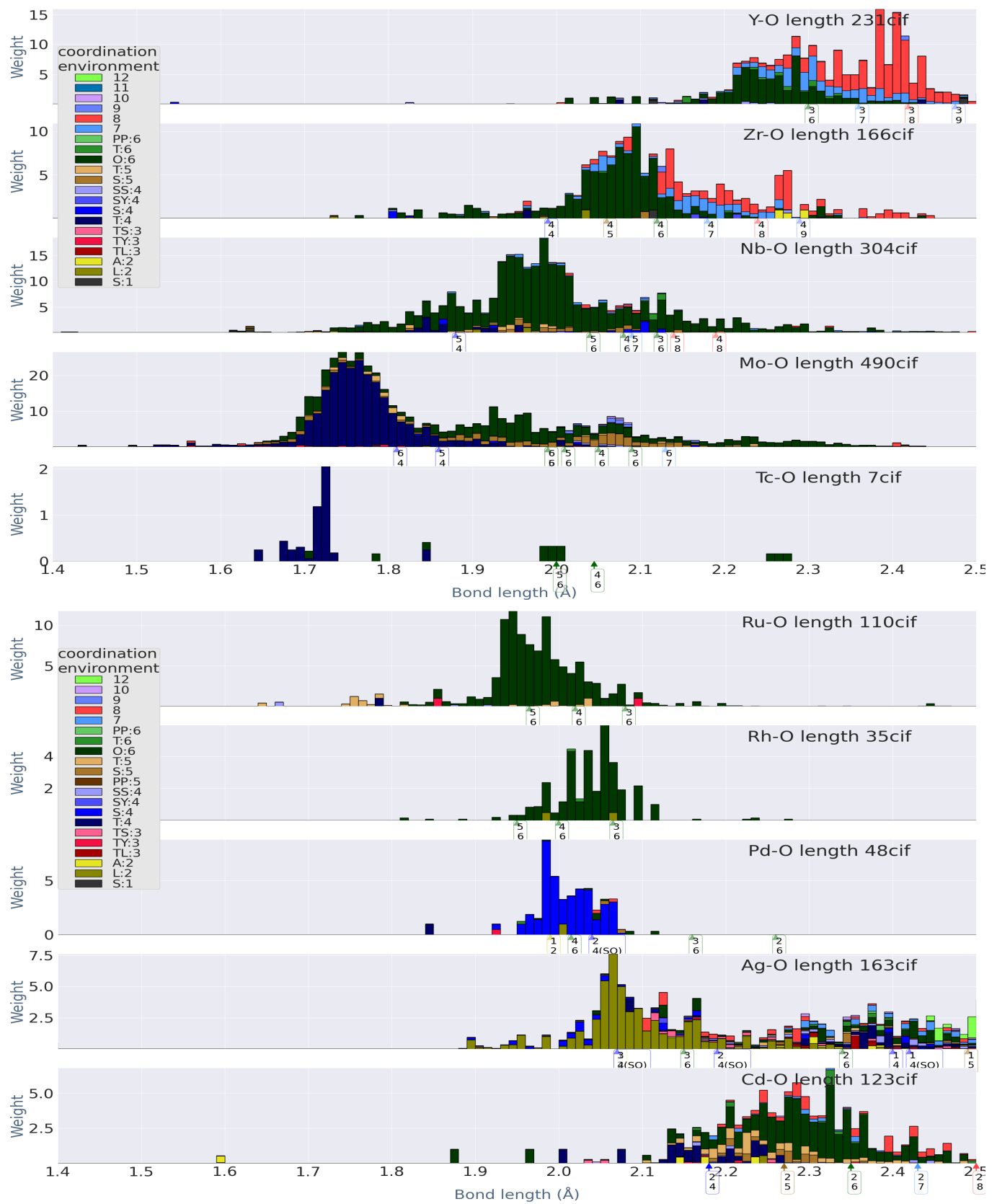


FIG. 3. Bond length distribution for 4d transition-metal elements. See text in Fig.??.

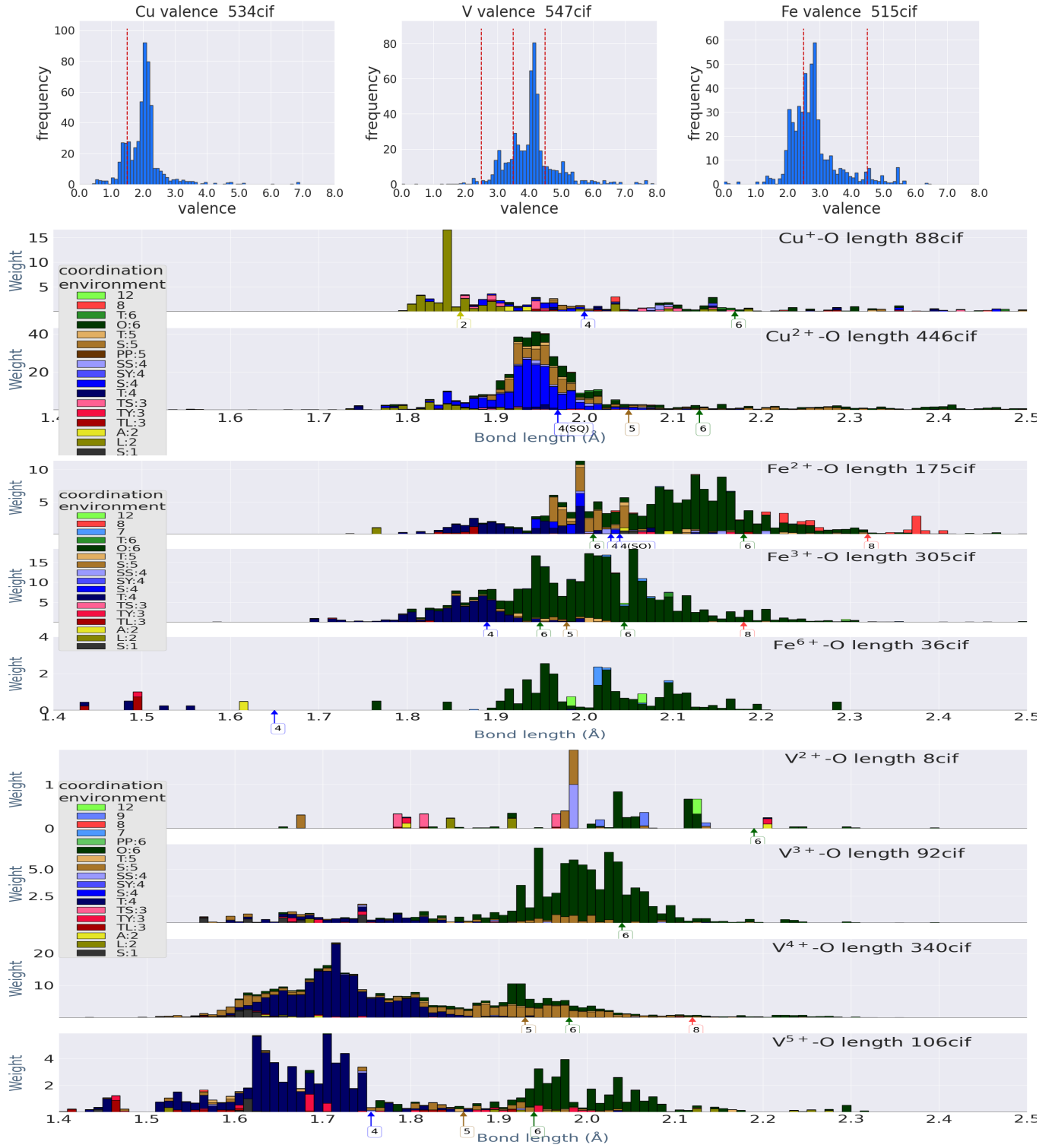


FIG. 4. Bond length distribution of Cu, V, and Fe, resolved by ion valency. Top three panels show the histogram of the bond-valence sum (BVS); red broken lines are boundaries of valency for the panels of Cu, V, and Fe. Sum of the histograms for each elements reproduce Histograms in Fig.??.

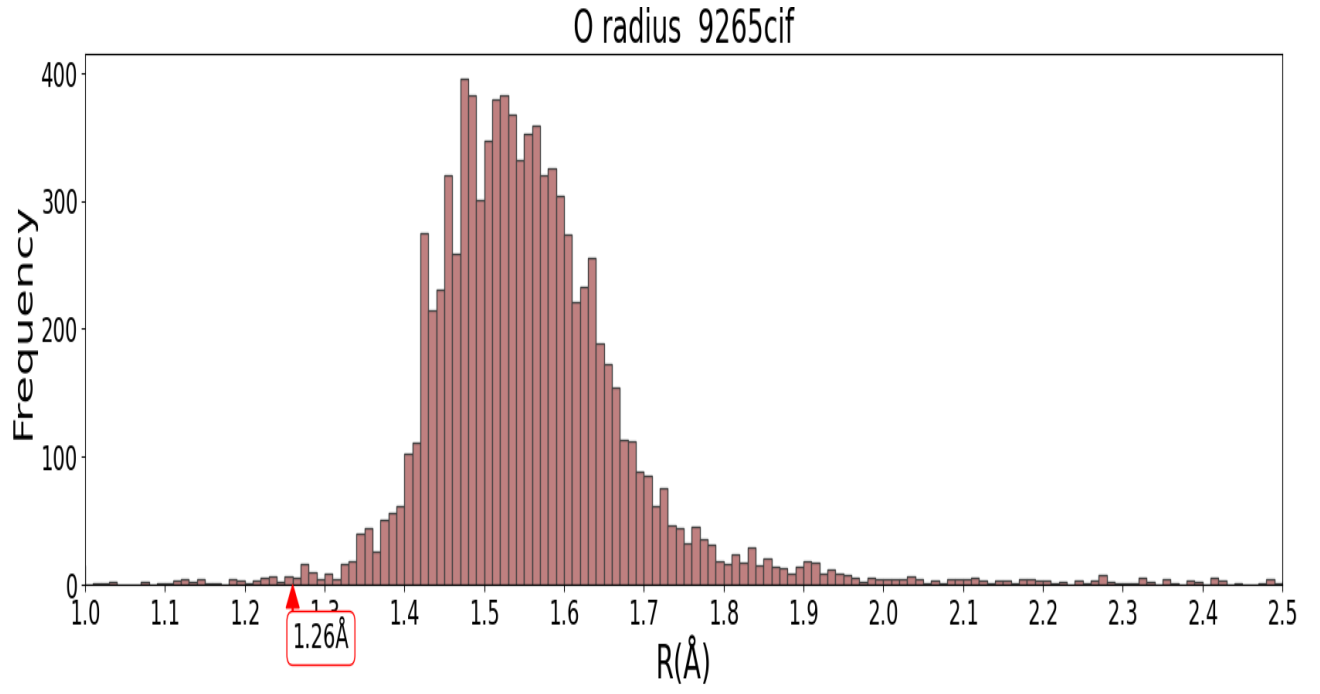


FIG. 5. We plot anion radius  $R$  of oxide. Here,  $R$  is defined as  $0.740V_{\text{cell}} = \frac{4\pi R^3 N}{3}$ , where 0.740 is the ratio of the closed-packed rigid spheres,  $V_{\text{cell}}$  is the cell volume, and  $N$  is the number of anion atoms per cell.