

Fig.S-1. (A) STXM image of Fe_3S_4 nanoparticles at 710 eV. (B) The S 2p, O 1s and Fe 2p XAS spectra of the Fe_3S_4 nanoparticles.

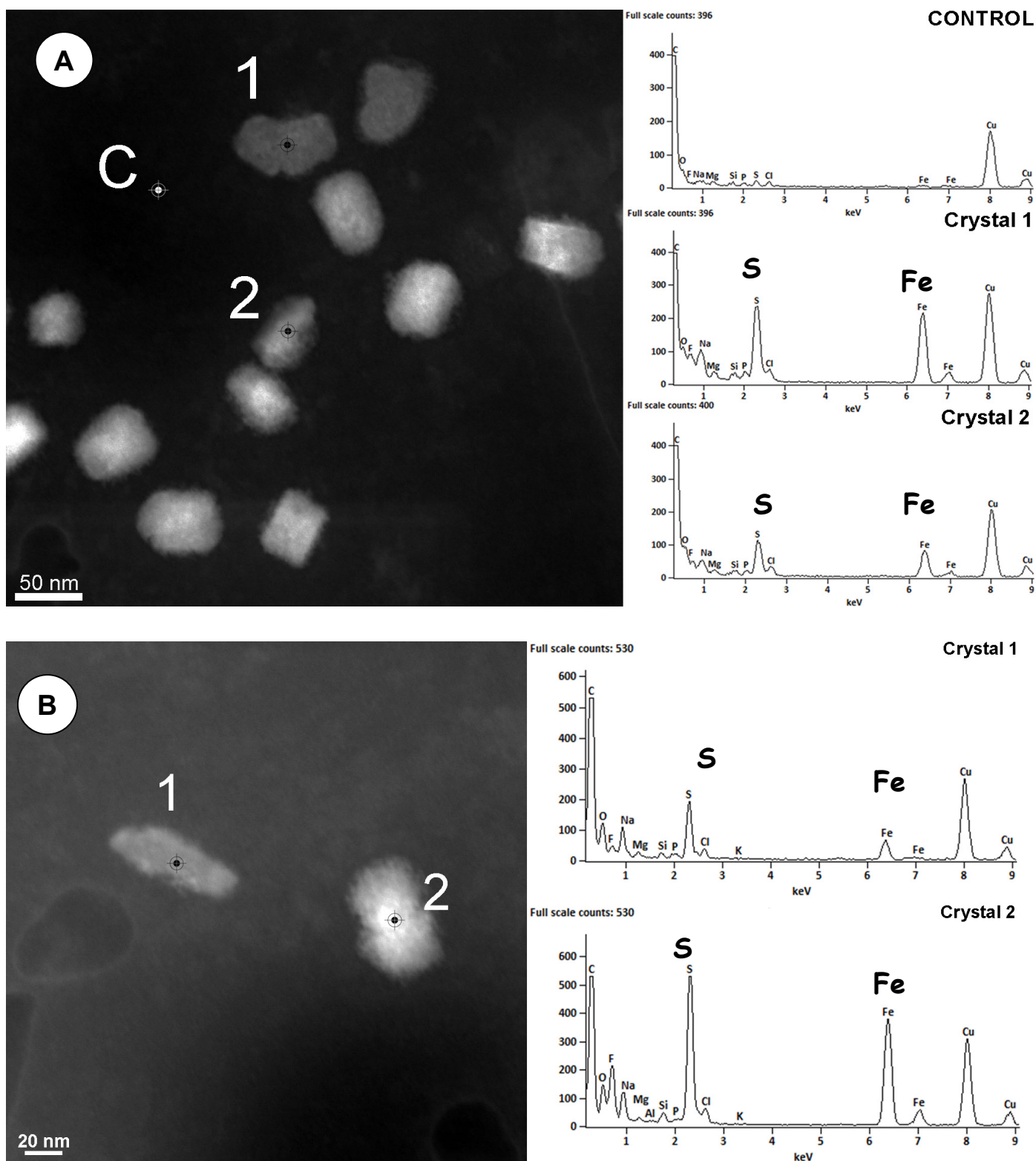


Fig. S-2. (A) STEM image and energy dispersive X-ray (EDX) spectrum of two magnetosomes (A1, A2), compared to a control (panel A, point C), inside the MMP, but off magnetosomes. The Cu lines are from the TEM grid. **(B)** EDX analysis showing that the elemental composition in elongated (B1) and pleomorphic magnetosomes (B2) in the MMP are similar. (Salton Sea)

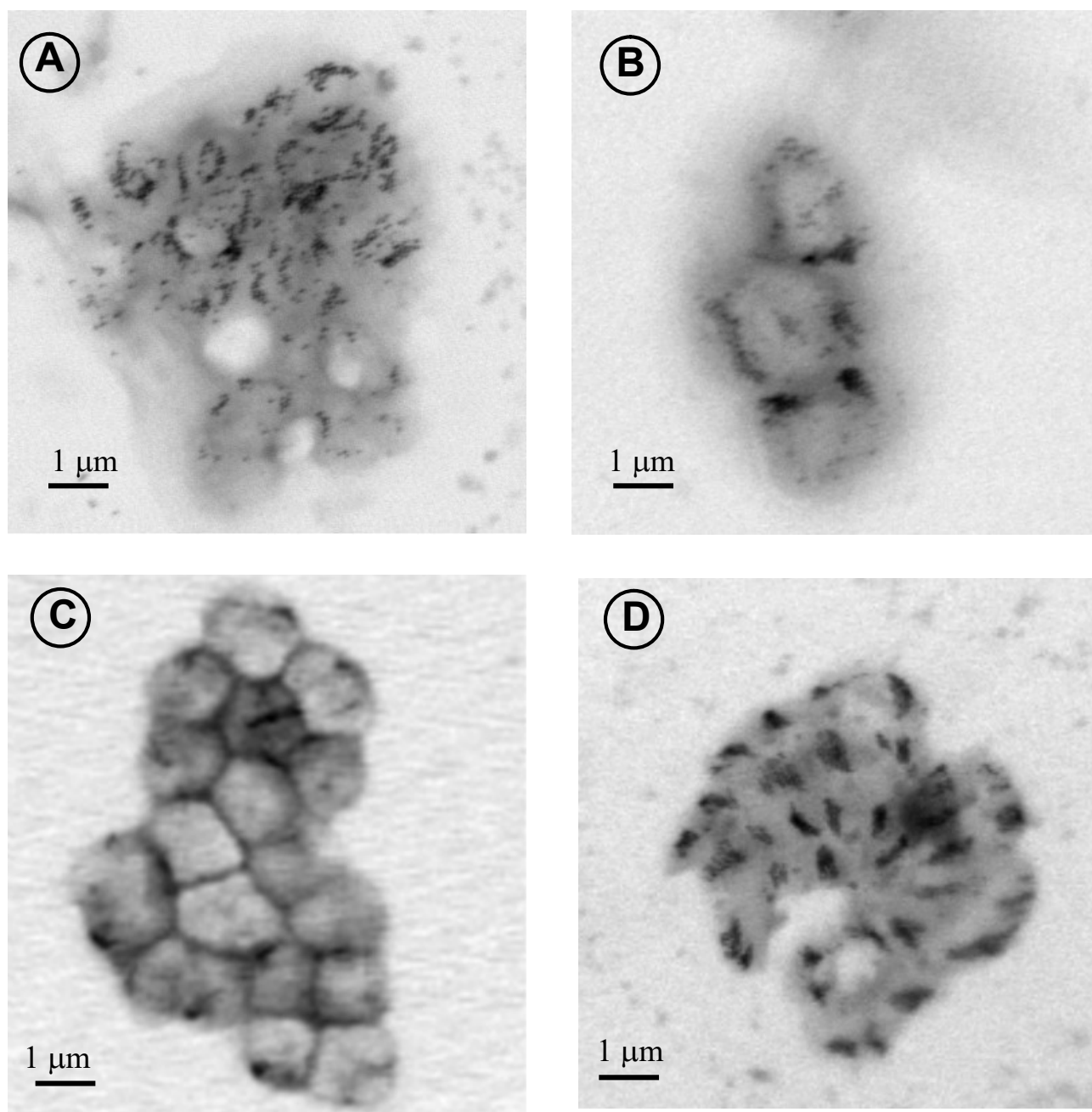


Fig.S-3. (A)~(D). STXM transmission images of four MMPs recorded at 708.3 eV. Of the four MMPs, the one shown in Figure S-2C was selected for detailed XAS study and the one in Figure S-2D was selected for detailed XMCD magnetic study. (Araruama Lagoon)

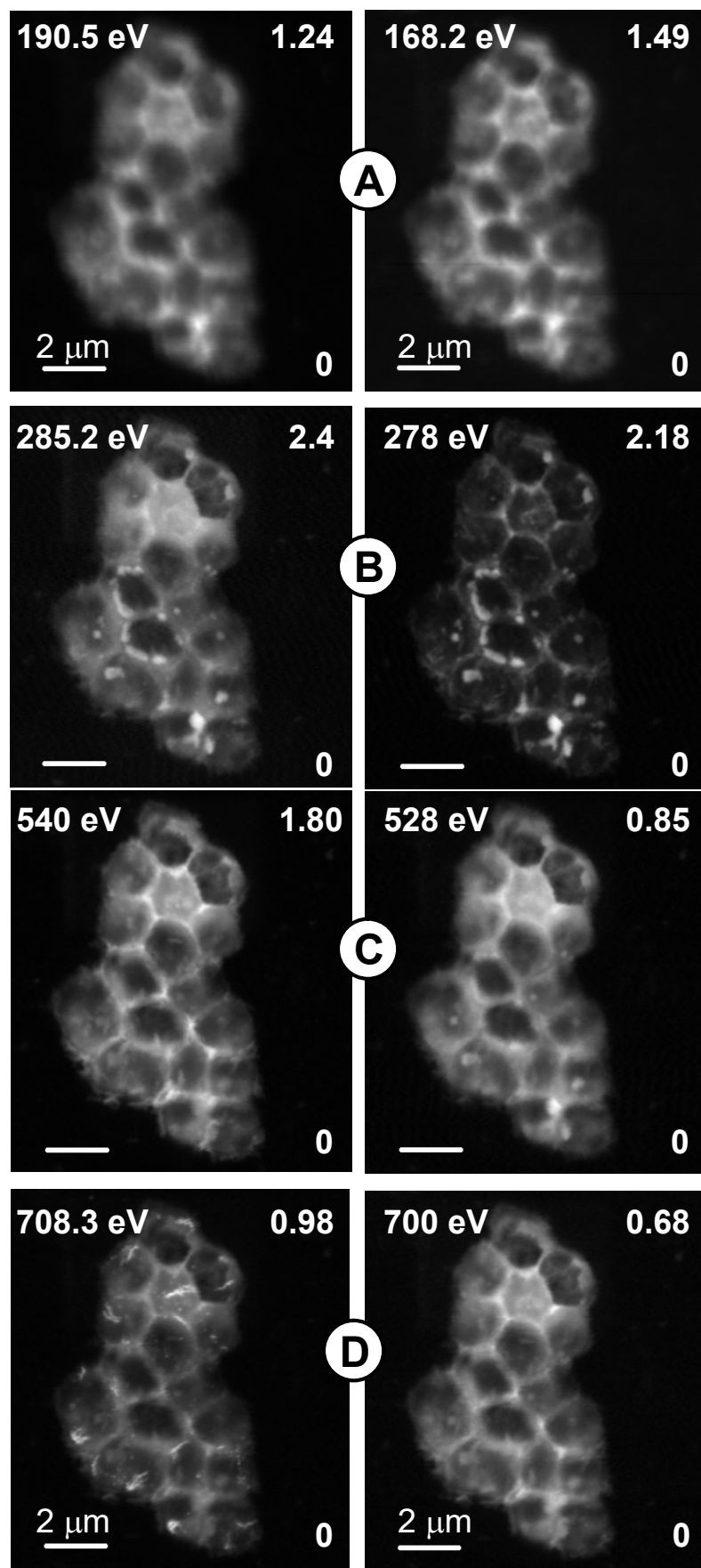


Fig.S-4. STXM OD images of an MMP at (A) 190.5 / 168.2 eV, (B) 285.2 / 278 eV, (C) 540 / 528 eV and (D) 708.3 / 700 eV. The difference of these pairs are plotted in Figures 5A - 5D. (Salton Sea)