The chemical redox zonation denotes the sequence of organic matter respiration depending on the energy-yield of redox reactions, and has been used as the yardstick in measuring the marine redox landscapes. Reconstruction of marine redox profile relies on the sequencing of individual redox zonation in the sediment-water profile. Early Cambrian witnessed the transition of marine redox condition and the evolution of animal. To explore the redox profile in the early Cambrian ocean, here we analyzed the early Cambrian black shale with abundant pyritized sponge spicules in South China. Pyritization of sponge spicules initiates with the dissolution of siliceous spicules creating voids in sediment, followed by the void-filling precipitation of subhedral pyrites, ranging from 50 to 100 um. In addition, abundant disseminated anhedral pyrites of 10~30 um in size might have predated pyritization of sponge spicules. Bulk sample analysis indicates pyrite sulfur isotopes ($\delta^{34}S_{py}$) of 17.3~21.3‰ and high pyrite content up to 10 wt.%, while the *in situ* $\delta^{34}S_{py}$ analyses by SHRIMP (Sensitive High Resolution Ion Micro Probe) indicate the overlapping range of $\delta^{34}S_{py}$ of spicule and disseminated pyrites. The S isotope data indicate that both spicule and disseminated pyrite had a homogenous S source from sulfidic seawater. In contrast, the *in situ* iron isotope ($\delta^{56}Fe_{py}$) analyses by LA-ICP-MS indicates significant enrichment of ^{56}Fe of disseminated pyrite than pyrite in sponge spicules. The Fe isotope data suggest the DIR in sediment and excessive Fe^{2+} supply compare with the consumption by pyrite precipitation, resulting in the accumulation of Fe^{2+} in porewater. Thus, our study indicates that pyritization of sponge spicules might have occurred in ferruginous pore-water with H_2S supply from the overlying euxinic seawater, illustrating a reversed redox profile in early Cambrian ocean with sulfate reduction in the water column and iron reduction in sediment.