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Ceres, the ice-rich dwarf planet in the asteroid belt, would provide a clue to understand formation processes of the planets in the solar system, as it is considered as one of a few proto-planets remaining today (Castillo-Rogez and McCord, 2010). Ceres’ surface reflectance spectra show a unique absorption at 3.06 μm, which is recently found to be caused by the presence of NH4-bearing hydrated silicates (e.g., mica) (De Sanctis et al., 2015). This in turn means that a large amount of NH3 should have been contained in Ceres’ interior ocean formed in the early stage of its evolution, and that Ceres’ building materials would have been originated from the outer solar system beyond the snowline of NH3 (De Sanctis et al., 2015). However, the formation of NH4-bearing hydrated silicates would depend on not only the presence of NH3 in the ocean but also the chemical compositions and pH of the interior ocean where the hydrated silicates were formed. Here, we performed hydrothermal experiments to constrain pH of the water on early Ceres. Based on the chemical analysis and comparisons of infrared spectra of the produced hydrated silicates, together with the findings of carbonates on Ceres, we show that pH of water on early Ceres should be near neutral. This is because NH4+ ions are incorporated into hydrated silicates under neutral pH conditions. To achieve neutral pH in the water, the rock compositions of Ceres would be different from that of carbonaceous chondrites. As sulfate salts were found on Ceres (Nathues et al., 2015), large amounts of sulfate ions may have worked as a major anion to keep the water pH as neutral. This further suggests that reducing sulfur in the core would have been oxidized by igneous activity on early Ceres sustained by short-lived radiogenic heating upon its early formation (within 3-5 Mys after CAIs).

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