

Fe,Mg,Mn-bearing phosphates in the GRA 95209 meteorite: Occurrences and mineral chemistry

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ABSTRACT

Two large regions of Fe,Mg,Mn-bearing phosphates, together with metal and various silicate phases, have been observed in the GRA 95209 meteorite (a primitive achondrite belonging to the acapulcoite–lodranite group). Numerous grains of an orthophosphate intermediate in composition between farringtonite and graffonite/sarcopsidite are found in association with Fe- and Mn-rich chladniite. The chladniite occurs as rims around the Ca-free phosphate (termed Mg-graffonite here) and along boundaries between Fe,Ni metal and silicate grains. Relict metal grains are included within both phosphates. Textures, as well as mineral compositions, suggest formation of the Mg-graffonite by reaction of Fe,Ni metal with surrounding silicates (olivine and orthopyroxene). Chladniite probably formed both through replacement of Mg-graffonite and directly by reaction of metal with silicates, including plagioclase. Apatite appears to have played only a minor role in the formation of these phosphates.