SULFUR ISOTOPIC COMPOSITION OF FE-NI SULFIDE GRAINS IN CI AND CM CHONDRITES. E. S. Bullock¹, K. D. McKeegan², M. Gounelle³, M. M. Grady⁴, S. S. Russell⁵.
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Introduction: Sulfide minerals are ubiquitous in meteoritic material and can provide information regarding the processes that have affected chondritic parent bodies. In this work, we look at sulfide grains within aqueously altered CI and CM chondrites. Previous work has shown that increasing aqueous alteration can modify the chemical composition of sulfide grains [1-3]. Sulfate minerals formed by the oxidation of sulfides [4]; this should have left a mark on the isotopic signature of the sulfide grains, as the newly formed sulfates incorporate 32S preferentially.

Method: Thin sections of two CI chondrites and six CM chondrites were analyzed. The CI chondrites are both extensively altered and are classified as type 1. One of the CM chondrites is also extensively altered (classified as CM1 by [5]; classified as CM2.0 by [3]). The other CM chondrites have undergone less extensive aqueous alteration. The isotopes 32S, 33S and 34S were measured with the UCLA Cameca IMS 1270 in multicollector mode following the method outlined in [6]. Results are all reported relative to Canyon Diablo troilite.

Results and Discussion: All of the grains measured lie within error of the mass dependent fractionation line. No anomaly in 33S was found. The CI1 sulfides are generally isotopically heavy (δ34S_CDT from -0.7‰ to 6.8‰), while sulfide grains in the CM1 chondrite are generally depleted in 33S and 34S (δ33S_CDT between -1.6‰ and 1.0‰; δ34S from -2.9‰ to 1.8‰). The CM2 chondrites contain sulfide grains that show enrichment and depletion in 33S and 34S (δ33S_CDT between -3.5‰ and 3.8‰; δ34S_CDT from -7.0‰ to 6.8‰). It has been suggested that sulfates forming from sulfide grains during aqueous alteration will preferentially remove the lighter isotope, leaving the sulfide grains enriched in the heavy isotopes. However, the degree of enrichment in 34S in sulfide grains does not correlate with previously proposed alteration sequences, indicating that the sulfur isotopic signature of sulfide grains records a more complex history.