compared to 540 ± 60 (Goles, 1971). The Cu/As ratios are similar in three types of meteorites analysed, indicating the same depletion factors for Cu and As in type 2 and 3 carbonaceous chondrites.

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EVIDENCE OF ^{26}Mg EXCESS IN HIBONITE FROM MURCHISON

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We report Mg isotopic analyses on a hibonite inclusion from Murchison (CM), named the Blue Angel for its distinct color, and discovered by R.H. Becker. Petrographic, mineralogic, and chemical information is provided in a companion abstract (Armstrong *et al.*, 1980). Hibonite is important as it has the highest estimated condensation temperature for major element oxides (Blander and Fuchs, 1975), may have a high Al/Mg ratio, and may be chemically resistant to alteration. The Mg measurements reported here extend to Murchison the application of high precision mass spectrometric analyses. We list in Table 1 analyses by direct loading of three ~ 50 μm crystals from the core of the inclusion and the results on a fourth crystal which was fused and the Mg chemically separated. The techniques were described (Lee *et al.*, 1977a; Esat *et al.*, 1979a). Two of the crystals were rinsed in 1N HCl to remove soluble phases (*e.g.*, $CaCO_3$) possibly rich in Mg, so as to enhance effects from hibonite. All crystals yield a uniform, raw ^{25}Mg/^{24}Mg) corresponding to unfractionated Mg isotopes relative to terrestrial Mg to within 1‰ per amu. All directly loaded crystals show a uniform, distinct excess $\delta(^{26}Mg/^{24}Mg) = 13.6‰$. This excess is resolved without the need to normalize for instrumental fractionation and demonstrates the presence of excess ^{26}Mg in this inclusion. The fused sample yields a lower ^{26}Mg excess due to contamination during fusion but which confirms the existence of the effect. If we assume that the observed excess is due to ^{26}Al decay and with an average Al/Mg from Armstrong *et al.* (1980), and if we assume a normal initial ^{26}Mg/^{24}Mg, we obtain $^{26}Al/^{27}Al = 5 \times 10^{-5}$ at the time of formation of the Blue Angel. This ratio is similar to that for Allende inclusions BG2-6, WA, Egg-1, Egg-2, and Egg-3 (Lee *et al.*, 1976; Lee *et al.*, 1977b; Esat *et al.*, 1979b), but contrasts with $^{26}Al/^{27}Al < \times 10^{-7}$ in the HAL hibonite from Allende (Lee *et al.*, 1979) and with reports of $^{26}Al/^{27}Al \sim 10^{-3}$ in hibonite from Leoville using an ion-probe (Lorin and Christophe, 1978). Using an ion-probe, Macdougall and Phinney (1979) found for Murchison that the hibonite crystals (100-500 μm) they analyzed were normal within their lower precision of 5-10‰ except for a hint of excess ^{26}Mg in one hibonite inclusion. They also observed highly fractionated Mg isotopes in another crystal. Tanaka *et al.* (1980) reported excess ^{26}Mg in melilite from Murchison, but the absence of ^{26}Mg excess in hibonite. We conclude that there is now clear evidence for significant excess of ^{26}Mg in hibonite in Murchison. The inferred ^{26}Al/^{27}Al for the Blue Angel hibonite (high temperature) does not differ significantly from that commonly found in the anorthite (lower temperature).

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Table 1
Murchison: Blue Angel Hibonite

Mean Crystal Dimension	Fractionation[a] $\delta(^{25}Mg/^{24}Mg)$ ‰ per amu	$\delta^{26}Mg$[b] ‰
1. 70 μm (blue)	−1 ± 1	13.6 ± 1.2
2. 50 μm (grey)[c]	+0.5 ± 1	13.7 ± 0.8
3. 40 μm (blue)[c]	−0.5 ± 1	13.6 ± 0.3
4. Fused hibonite	+1 ± 1	6.3 ± 2.0

With $^{27}Al/^{24}Mg = 42, (^{26}Al/^{27}Al)_o = 5 \times 10^{-5}$

[a]Fractional deviation of the raw measured ratio from $^{25}Mg/^{24}Mg = 0.12475$ for normal Mg. $\delta/^{25}$Mg/^{24}Mg) is the Mg isotope fractionation.
[b]Excess ^{26}Mg relative to normal (^{26}Mg/^{24}Mg) after correction for fractionation. Errors are $2\sigma_m$.
[c]HCl rinse.