Deuterium–Hydrogen Ratio in Jupiter

Reeves and Bottinga, in discussing the D/H ratio in Jupiter[1], claim to make an estimate of this ratio based on theoretical work by Geiss and Reeves[2]. In fact, the only value given is that which we have ourselves derived[3] from a detailed reduction of the observational data of Beer *et al.*[4]. This result is incorrectly attributed to Black (to whom we had communicated our results) and is stated to be the D/H ratio in the CH_4 phase, which is also incorrect. Our result pertains to the overall isotopic ratio.

Furthermore, we are at a loss to understand how theoretical arguments based on tenuous considerations of chemical equilibria in the proto-solar nebula and carbonaceous chondrites were ever intended to lead to a value for the present-day D/H ratio in Jupiter.

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Search for Plutonium-244 Tracks in Mountain Pass Bastnaesite

WE have found that bastnaesite, a rare earth fluorocarbonate, from the Precambrian Mountain Pass deposit has an apparent Cretaceous fission track age, and hence does not reveal any anomalous fission tracks due to ^{244}Pu.

Hoffman *et al.*[1] reported the first definite observation of ^{244}Pu existing in nature when they isolated 2×10^7 atom of ^{244}Pu from bastnaesite-rich ore from Mountain Pass, California. Because ^{244}Pu has an 82 m.y. half life, its presence today, 56 half lives after the formation of the Earth, is a most impressive accomplishment which has raised questions as to whether the ^{244}Pu could represent not primordial matter but later inflow of cosmic matter before the formation of the Mountain Pass deposit.

Because one of the methods of recognizing the decay of ^{244}Pu is by observing the radiation damage tracks produced by its spontaneous fission[2,3], we have fission track dated[4,5] the bastnaesite and accessory minerals from the adjacent rock at Schenectady and Denver, respectively, using methods described previously[5,7].

The bastnaesite was separated from the main carbonatite body, and the apatite and sphene were separated from two genetically related, contemporaneous[8] shonkinite dikes. The bastnaesite was etched in 19% HCl at 55° C for 90 min using ~100 μm crystals. Calculated fission track lengths for $CeFCO_3$ are 16.8 μm; observed lengths extended up to 16.0 μm. This bastnaesite is characterized by an etching efficiency relative to Lexan polycarbonate of 0.62 (±0.07) and has a uranium concentration, as determined by induced fission tracks, of 21.2 (±1.8) p.p.m. by weight as compared to 18.1 (±1.0) p.p.m. by mass spectroscopy (F. Rourke, GE Knolls Atomic Power Laboratory, personal communication). Most of the tracks in the bastnaesite could be removed after one hour at 300° C (±20° C).

Table 1 shows that the age of the biotite (MP-21, 22) and sphene (MU-38) is approximately 1,400 m.y., but the fission track ages of the apatite and bastnaesite range from 50 to 80 m.y. These ages are consistent with the relative ease of thermally removing tracks in apatite[9] and bastnaesite, as compared with sphene and the presence of the 50 to 80 m.y. age "Laramide" orogenic event[8,10].

Table 1 Ages of Mountain Pass, California, Samples

Material dated*	Dating method	Age (million years)	Rock type
Biotite (MP–21, MP–22)	K–Ar	1,440, 1,390 (ref. 6)	Shonkinite
Biotite (MP–21, MP–22)	Rb–Sr	1,380, 1,420 (ref. 6)	Shonkinite
Sphene (ML–16)	Fission track	1,170±120 (2σ)	Shonkinite
Sphene (MU–38)	Fission track	1,400±180 (2σ)	Shonkinite
Apatite (ML–16)	Fission track	53±10 (2σ)	Shonkinite
Apatite (MU–38)	Fission track	60±12 (2σ)	Shonkinite
Bastnaesite	Fission track †	78±10 (2σ)	Carbonatite

* Sample localities:
MP–21, 22: Birthday Shaft.
ML–16: 7,250 ft. S50° W of Wheaton Springs, Calif.
MU–38: 11,250 ft. S80° W of Wheaton Springs, Calif.
Bastnaesite, Sulfide Queen carbonatite body.
† Total track counts from 18 different crystals.

The nearly concordant dates for the bastnaesite and apatite indicate that there is no ^{244}Pu fission track excess over the ^{238}U track density. Given this low age, no such excess was to be expected. Therefore fission tracks cannot provide any support to the Hoffman *et al.*[1] reported observation of ^{244}Pu in the Mountain Pass bastnaesite.

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Ventilation Inception on Surface Piercing Foils or Struts

VENTILATION is a problem of long standing associated with high speed hydrofoil craft. The sub-atmospheric pressures, generated by the movement of the foils through the water, can cause air to be drawn from above the free surface to form a stable or semi-stable cavity attached to the foil. When associated with lifting foils, ventilation causes a marked loss of lift and in other instances can result in loss of directional stability.

The existence of a region of separated flow has been cited as a requirement before ventilation can take place on a foil[1] and recent studies have confirmed this view (B. N. Cole and our work, in preparation). Nevertheless it has also been shown[2]