DRAFT

# 78236

Shocked Norite

93.06 grams

*Figure 1: PET photo of freshly broken surface of 78236. Cube is 1 cm. Photo number S73-*

## Introduction

Sample 78236 was chipped from the Station 8 boulder from an area close to 78235 (see discussion in section on 78235). The outside T1 surface is partially covered with black glass, while the freshly broken B1 surface (figure 1) shows the coarse-crystalline orthopyroxene-plagioclase cumulate texture typical of this norite boulder. This sample was used for most age dating studies, because it appears to be the most fresh and unaffected by the glass coating.

The orthopyroxene in 78236 has been studied in detail by Takeda et al. (1982) and indicates that this rock cooled slowly deep in the lunar crust above 1000 deg. C, then rapidly after excavation by an impact event, and then slowly again at moderate temperature.

## Petrography

Nyquist et al. (1981) provided a detailed petrographic description of 78236 and showed that is of the same lithology as 78235.

## Mineralogy

In addition to the minerals discussed in 78235, Nyquist et al. (1982) note the presence of minor K-feldspar, which would affect Rb-Sr age dating.

***Pyroxene***: Takeda et al. (1982) found that the orthopyroxene ($En_{76}Fs_{21}Wo_3$) in 78236 lacked augite exsolution on the (100) plane, but had abundant Guinier-Preston zones, several unit-cells wide.

## Chemistry

An analysis of 78236 (table 1) was published in an abstract by Blanchard and McKay (1981) and found

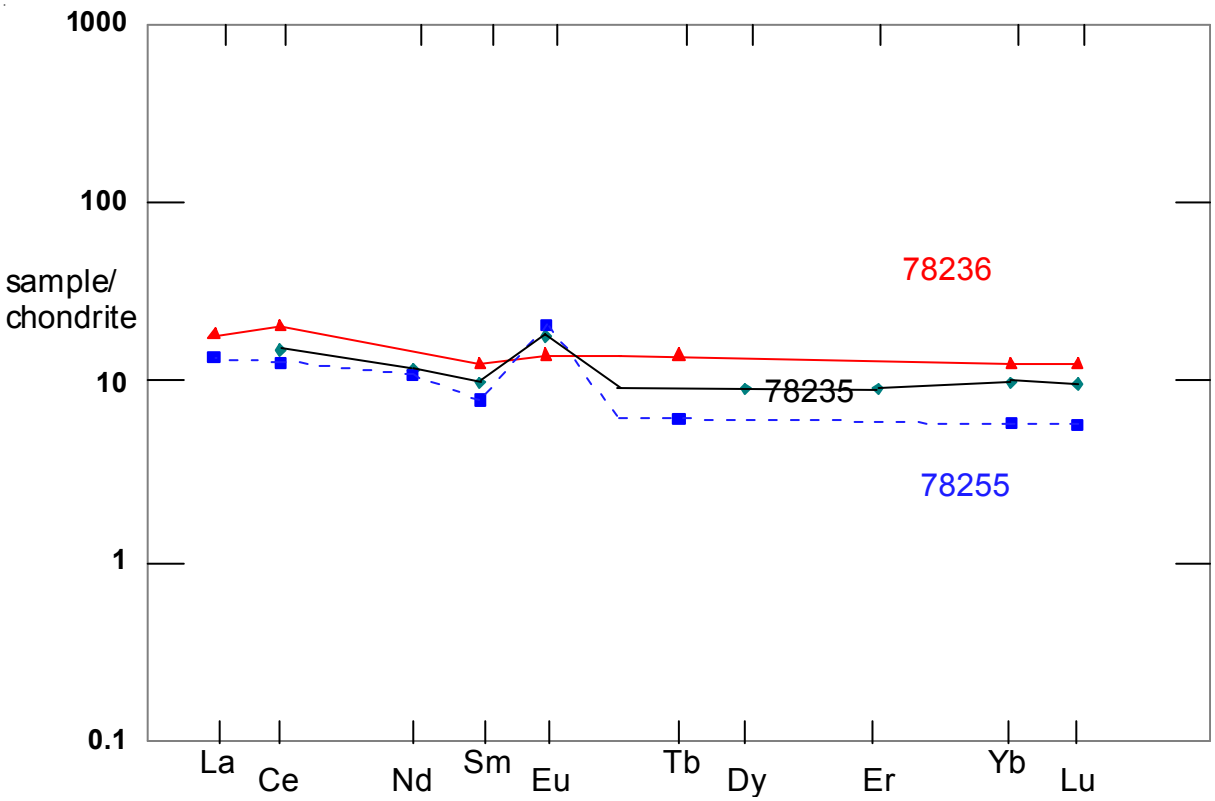


*Figure 2: Normalized rare-earth-element diagram for samples of station 8 boulder. This data is in agreement, considering the coarse grain size of the rock and small alloquot used for analysis. Data from Blanchard, Warren and Wasson and Winzer (see tables).*

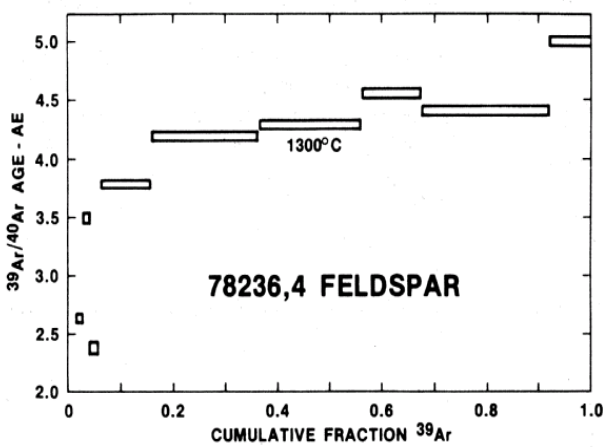


*Figure 3: Ar release pattern for plagioclase separates from 78236. From Nyquist et al. (1981).*

to be generally similar to that of 78235 and 78255 (figure 2).

## Radiogenic age dating

Nyquist et al. (1981) (figure 3-5), Carlson and Lugmair (1981) (figure 6) and Aeschlimann et al. (1982) (figure 7) have dated lunar sample 78236 (see summary table in section on 78235).

## Cosmogenic isotopes and exposure ages

Aeschimann et al. (1982) report an exposure age ($^{36}$Ar) of 300 m.y. Drozd et al. (1977) determined 292 ± 14 m.y. using the $^{81}$Kr-Kr method.

## Processing

List of Photos #
S73-17813
S73-15394

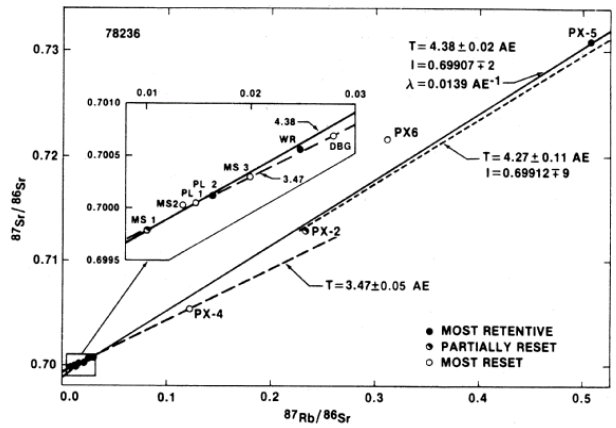


*Figure 4: Rb-Sr isochron for 78236. From Nyquist et al. (1981).*

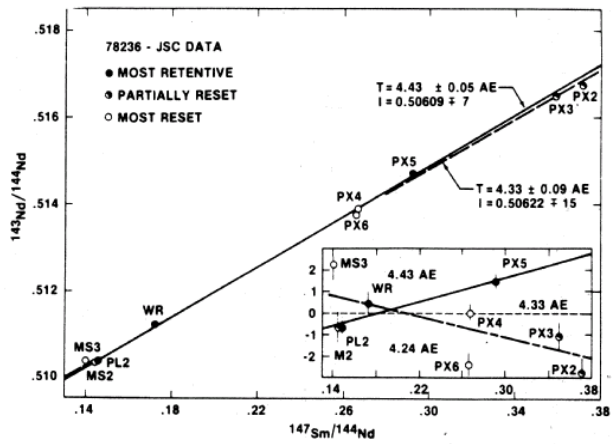


*Figure 5: Sm-Nd isochron for 78236. From Nyquist et al. (1981).*

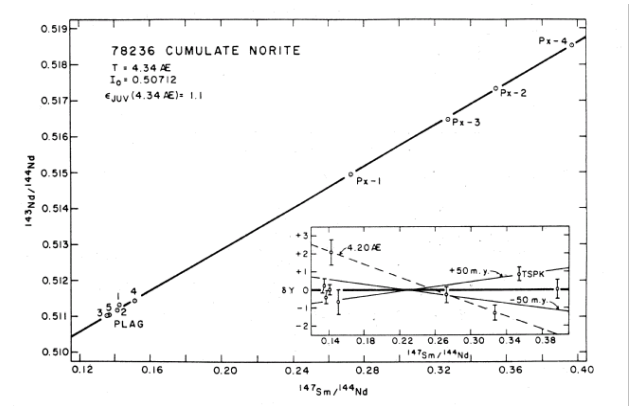


*Figure 6: Sm-Nd isochron for 78236. From Carlson and Lugmair (1981).*

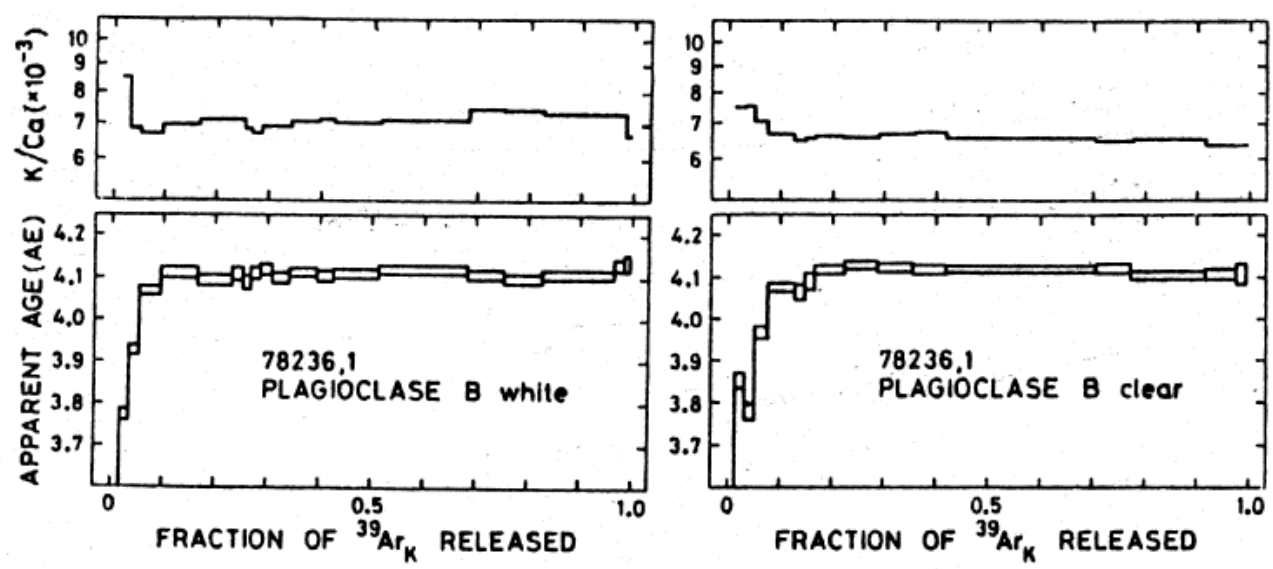


*Figure 7: Ar release pattern for plagioclase from 78236. From Aeschlimann et al. (1982).*

## Table 1. Chemical composition of 78236.

| *reference* | Blanchard 81 | | Nyquist 81 | |
|---|---|---|---|---|
| *weight* | | | | |
| SiO2 % | 50.15 | | | |
| TiO2 | 0.18 | | | |
| Al2O3 | 17.66 | | | |
| FeO | 6.49 | | | |
| MnO | 0.12 | | | |
| MgO | 14.28 | | | |
| CaO | 10.12 | | | |
| Na2O | 0.31 | | | |
| K2O | 0.04 | | | |
| P2O5 | 0.08 | | | |
| S % | 0.02 | | | |
| *sum* | | | | |
| | | | | |
| Sc ppm | 11.2 | (a) | | |
| V | | | | |
| Cr | 2120 | (a) | | |
| Co | 28.2 | (a) | | |
| Ni | | | | |
| Cu | | | | |
| Zn | | | | |
| Ga | | | | |
| Ge | | | | |
| As | | | | |
| Se | | | | |
| Rb | | | 0.862 | (b) |
| Sr | | | 104 | (b) |
| Y | | | | |
| Zr | | | | |
| Nb | | | | |
| Mo | | | | |
| Ru | | | | |
| Rh | | | | |
| Pd ppb | | | | |
| Ag ppb | | | | |
| Cd ppb | | | | |
| In ppb | | | | |
| Sn ppb | | | | |
| Sb ppb | | | | |
| Te ppb | | | | |
| Cs ppm | | | | |
| Ba | | | | |
| La | 4.47 | (a) | | |
| Ce | 12.8 | (a) | | |
| Pr | | | | |
| Nd | | | 7.02 | (b) |
| Sm | 1.93 | (a) | 2 | (b) |
| Eu | 0.82 | (a) | | |
| Gd | | | | |
| Tb | 0.53 | (a) | | |
| Dy | | | | |
| Ho | | | | |
| Er | | | | |
| Tm | | | | |
| Yb | 2.12 | (a) | | |
| Lu | 0.32 | (a) | | |
| Hf | 1.7 | (a) | | |
| Ta | 0.2 | (a) | | |
| W ppb | | | | |
| Re ppb | | | | |
| Os ppb | | | | |
| Ir ppb | | | | |
| Pt ppb | | | | |
| Au ppb | | | | |
| Th ppm | 0.6 | (a) | | |
| U ppm | | | | |

*technique (a) INAA, (b) IDMS*