GRV 020090 – 7.54 grams
Enriched Olivine-phyric Shergottite

Introduction

Russell et al. (2005) report that the 2002-2003 Chinese expedition to Antarctica returned with 4448 meteorites, including another Martian meteorite labeled Grove Mountains 020090. It had a nearly complete fusion crust.

Russell et al. (2005) state that it is unlikely to be "paired" with GRV 99027, "because of differences in texture and mineral chemistry".

Petrography

The petrology of GRV 020090 has been reported by Miao et al. (2004) and Lin et al. (2008); summarized by Russell et al. (2005) and Jiang and Hsu (2012). GRV020090 consists of two parts: poikilitic (30%) and nonpoikilitic interstitial areas (70%). The area with poikilitic texture is composed of several large pyroxene oikocrysts (>8 mm), each with a pigeonite core and a thick augite rim and enclosing olivine and chromite grains. The interstitial areaa consist of olivine, pigeonite and maskelynite, with accessory laths of merrillite coexisting with maskelynite. Tiny grains of baddeleyite have been found, some associated with ilmenite (Lin et al. 2008).

Magmatic melt inclusions are found in olivine and pyroxene.

Mineral Chemistry

Olivine: Olivine is Fo_{70-60}.

Pyroxenes: Pigeonite is zoned $En_{60-72}Fs_{24-29}Wo_{3-14}$ and rimmed by augite is $En_{47-52}Fs_{16-19}Wo_{31-36}$.

Maskelynite: Shocked plagioclase is $An_{37-57}Ab_{41-58}Or_{1-6}$.

Chromite: Chromite grains found in oikocrysts is low in Ti, which chromite in interstitial areas has high Ti associated with ilmenite (Lin et al. 2008).

Phosphate: The phosphate in GRV020090 is merrillite (Jiang and Hsu 2012).

Chemical composition

Jiang and Hsu (2012) determined the composition of the fusion crust and of merrillite, from which the calculated the REE pattern (figure 1). The relatively flat pattern indicates this rock belongs to the "enriched" shergottites and distinguishes it from GRV99027.

Radiogenic Isotopes

GRV020090 contains small baddeleyite grains (3 to 22 microns) which have been measure for U-Pb by ion microprobe (Jiang and Hsu 2012). The U/Pb age is found to be 196 ± 12 m.y. (figure 2).

References for GRV020090

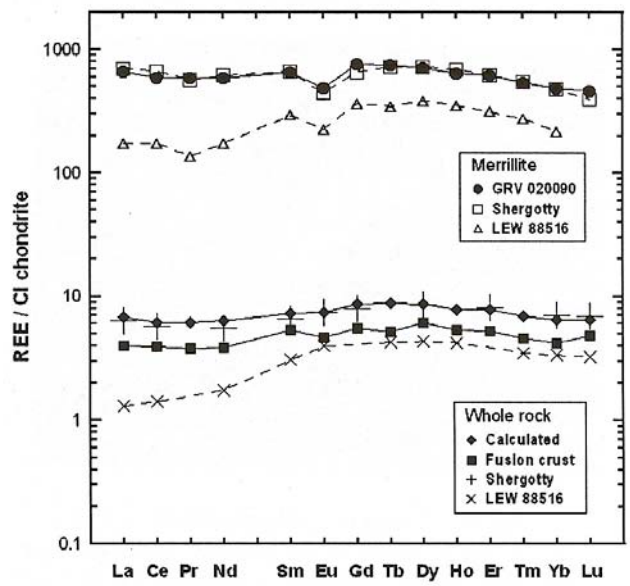

Figure 1: *REE patterns for fusion crust and for phosphate in GRV020090 (from Jiang and Hsu 2012).*

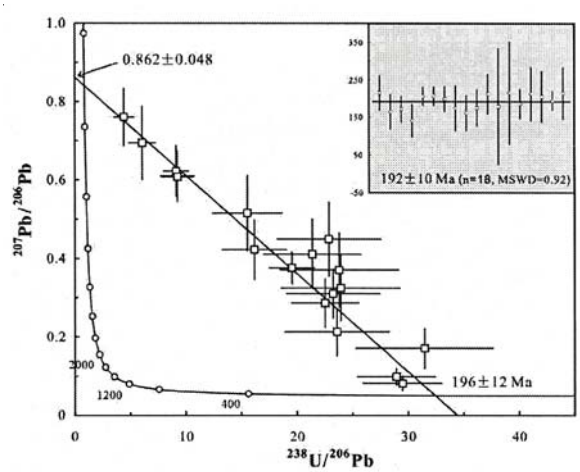

Figure 2: *U/Pb age dating baddeleyite in GRV020090 (by Jiang and Hsu 2012).*