INTRODUCTION:

Of the 24,000 or so meteorites that have been discovered on Earth, 35 have been identified as Martian meteorites. These meteorites are geologically young, with relatively young crystallization ages (1.3 billion years or younger). They can be identified because of their chemical characteristics, which are distinctly different from those of ordinary meteorites. These characteristics include high nickel and iron contents, low calcium and magnesium contents, high abundance of certain metal elements, and low titanium and vanadium contents. They are also characterized by a high proportion of olivine, pyroxene, and minor amounts of troilite. These unique chemical and mineralogical characteristics are thought to be the result of the unique magmatic processes that occurred on Mars.

PROCEDURE:

1. Mars and Earth samples were polished to ensure smooth surfaces.
2. The laser ablation technique was used to ablate small samples of Martian meteorites.
3. The aerosols were then analyzed using a high-resolution mass spectrometer.

RESULTS OF SPOT LASER:

Analytical methodology:

The analyses were performed on a high-resolution mass spectrometer, which allowed for the detection of trace elements with high precision. The samples were characterized by their unique chemical composition, which is distinct from that of ordinary meteorites. The results confirmed the Martian origin of the samples, which is consistent with their diverse mineralogy and geochemistry.

PROJECT EXTENSION:

METEORITE NWA 5990 RASTERED FOR BULK COMPOSITION

CONCLUSION:

Earth and Mars have similar relative abundances of germanium and silicon dioxide as shown in Figure 1 by the overlap of the data points for the terrestrial basalt (Siqueros) and the Mars meteorites (Shergotty, Zagami, Los Angeles, and NWA 5990). This plot also includes data showing that the abundance of germanium is 10^X greater in terrestrial and Martian basaltah than in angrites, and 100X to 1000X greater than in eucrites and lunar meteorites. (Angrite is a rare achondrite that may have originated from the asteroid 289 Nenetta and/or 3818 Robinson. Some scientists have even suggested that angrites could represent ejecta from Mercury. Eucrites and basaltic stony meteorites, many of which originate from the surface of the asteroid 4 Vesta.) This evidence is consistent with the hypothesis that the planet Mercury has a similar geology to that of Mars. Our data were collected in a microanalytical mode from which bulk analyses were estimated. We can also see how distinct minerals exhibit different Ge abundances. Olivine, (Mg,Fe)SiO₃, is the low SiO₂ mineral with high Ge abundances. On Earth, the basalt from Siqueros shows that olivine has lower Ge than the glasses, while on Mars, olivines from the Martian meteorites exhibit generally higher Ge than the remainder of the minerals (plagioclase and pyroxene) which are higher in SiO₂. This information will eventually allow internal chemical changes induced in individual rock samples to be better related to bulk planetary chemical composition.