PETROLOGY OF NEW STANNERN-TREND EUCRITES AND EUCRITE GENESIS. K. G. Gardner[1] and D. W. Mittlefehldt[2], [1]University of Oklahoma, Norman OK (kyanitekat@ou.edu), [2]NASA/Johnson Space Center, Houston, TX (david.w.mittlefehldt@nasa.gov).

Introduction: Eucrites are basaltic meteorites of the howardite-eucrite-diogenite (HED) suite that originated on a differentiated asteroid, possibly 4 Vesta [1]. Basaltic eucrites are divided into three subgroups based on composition: main group, Stannern-trend, and Nuevo Laredo-trend. The main group and Nuevo Laredo-trend define a sequence formed by fractional crystallization of pigeonite and plagioclase from primitive parent melts [2, 3]. The Stannern-trend cannot be explained this way [2, 3], but may rather represent a partial-melt sequence of their parent body [2]. However, this model seems inadequate to explain eucrite siderophile element contents [4], and it is difficult to develop a single unifying model for petrogenesis of all eucrites [5]. Until recently, there were only four Stannern-trend eucrites. One is an anomalous partial cumulate [6]. There is little geochemical variation among these meteorites, so the Stannern-trend was poorly defined. Geochemical studies have identified four additional eucrites as members of the Stannern-trend (Fig. 1); one extends the Stannern-trend closer to the main group [5]. No detailed descriptions of these rocks have been published. In order to better integrate these eucrites into the suite, we have done petrologic study of them. They are: LEW 88010, PCA 82501, PCA 91006 and PCA 91179.

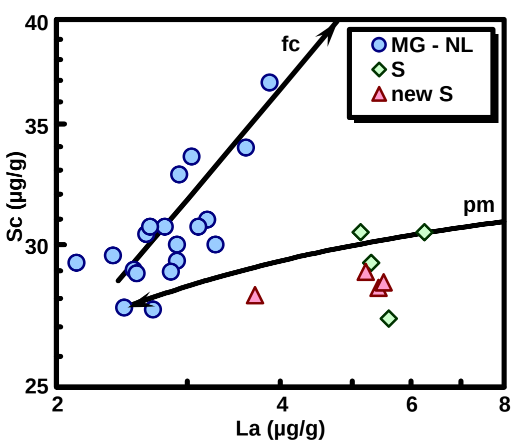

Fig. 1. Sc-La data on main-group – Nuevo Laredo-trend (MG-NL), Stannern-trend (S) and new Stannern-trend eucrites compared to partial melting (pm) and fractional crystallization (fc) models.

Petrology: PCA 91006 is potentially the most significant of the four because it is compositionally intermediate between the other Stannern-trend eucrites and the main group (Fig. 1). It exhibits a typical brecciated texture with a variety of igneous lithic clasts set in a matrix of fragmental mineral grains. We found two pyroxene types that can be distinguished optically. Some lithic clasts contain pyroxenes with parallel augite lamellae, sharp extinction, and high birefringence, while the others have pyroxenes with blebby augite, undulatory extinction, and low birefringence. Contacts between these pyroxene types in the breccia are sharp (Fig. 2).

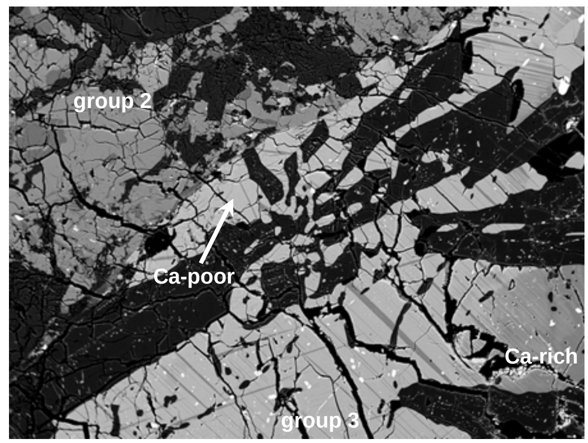

Fig. 2. BSE image of PCA 91006 shows a sharp boundary between two distinct pyroxene types. Darkest gray and black are plagioclase and silica. Image is 1 mm across.

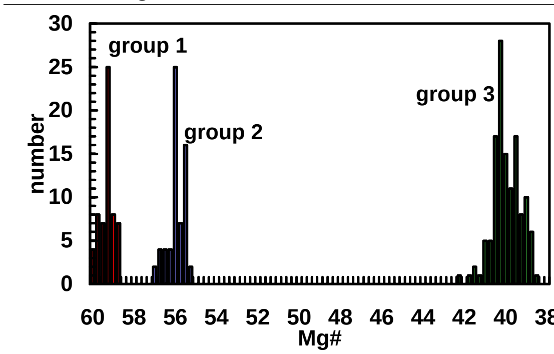

Fig. 3. Histogram of Mg#'s for spot analyses of PCA 91006 pyroxenes with <9% Wo component.

Electron microprobe analyses show that PCA 91006 contains distinct groups of pyroxenes based on Mg# (molar 100*MgO/(MgO + FeO)). A histogram of the Mg# of low-calcium host pyroxenes shows three distinct groups—two magnesium-rich and one iron-rich (Fig. 3). An equivalent histogram of only high-calcium pyroxenes shows the same groupings. Optically, groups 1 and 2 pyroxenes are not distinguishable; they are the low birefringence pyroxenes with