AN EXTENDED CLASSIFICATION SCHEME FOR THE ACAPULCOITES AND LODRANITES. A. Patzer, D. H. Hill and W. V. Boynton, Lunar and Planetary Laboratory, University of Arizona, Tucson, AZ 85721 (apatzer@lpl.arizona.edu).

Introduction: Acapulcoites and lodranites (AL) are counted among the primitive achondrites. Their bulk composition roughly matches that of ordinary chondrites but was altered by heterogeneous partial melting and small-scale melt migration processes [e.g., 1,2,3,4]. Originally, the two subgroups were discriminated by means of grain size as well as feldspar and sulfide contents [5]. With the recovery of more and more class members from cold and hot desert, however, the bimodal classification scheme soon proved to be too limited to accommodate transitional samples [6].

Results and Discussion: We investigated 15 meteorites of the AL clan for their chemical inventory by INAA and report our final results. Our sample suite includes 5 new acapulcoites (Dho290, NWA725, GRA98028, NWA1058, and TIL99002) that we also studied petrographically. Altogether, we strongly support the findings of [6] and, from a bulk chemical point of view, suggest the discrimination of 5 subtypes.

At one end of the spectrum, we found a subgroup of meteorites (GRA98028, NWA725, NWA1058) with near-chondritic elemental abundances that we consider to be *primitive acapulcoites*. As distinct from them, the *typical acapulcoites* (ALH78230, Dho125, Dho290, Dho312, FRO95029, TIL99002), as we label them, show incipient melting and loss of sulfide phases. The extraction of troilite is reflected by Se depletions (fig. 1). In accordance with their chemical properties, these acapulcoites also exhibit more evolved textural features (e.g., lack of relict chondrules, recrystallization). The *transitional acapulcoites* (EET84302, GRA95209, Y8002) are marked by a deficit of sulfide phases accompanied by incipient melting and loss of plagioclase (as inferred from K depletions, fig. 1). The final evolutionary step is represented by the *lodranites*. They are defined by basically subchondritic elemental concentrations and reveal diagnostic troilite, metal, and plagioclase depletions (MAC88177). A chemically complimentary pattern to MAC88177 is displayed by LEW86220. This subtype, which we call *enriched acapulcoites*, shows clear additions of feldspar. It probably trapped some of the partial melt that was lost from the lodranite region of the common parent body.

The chemical differences between the individual subtypes, namely the primitive, typical, and transitional acapulcoites, are gradual and may be blurred by mineralogical heterogeneities that characterize the AL parent asteroid [4]. For this reason, it is often necessary and inevitable to gather additional petrographic information on a given sample in order to be able to assign it to one of the chemical subgroups mentioned above. In this context, we found that grain size may not be a distinctive feature (e.g., TIL99002 displays a grain size that falls close to the size range of lodranites [5]).

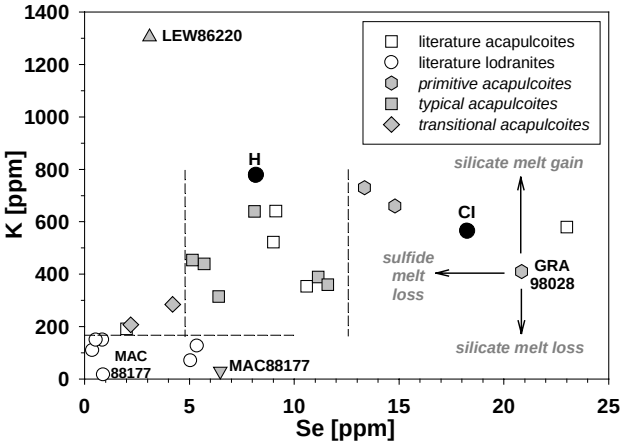

Fig. 1: Plotting K concentrations as a function of Se abundances exemplifies the chemical distinction of acapulcoites and lodranites in general, and different subtypes of acapulcoites in particular. All open symbols, divided into acapulcoites and lodranites, represent literature data. Our data are plotted in gray. Among the 15 meteorites of our sample suite, we consider GRA98028 to be the most primitive specimen. Relative to this sample, Se depletions indicate the loss of a sulfide-metal partial melt whereas the relative concentration of K reflects the extraction (in the case of the lodranites, e.g. MAC88177) or addition (in the case of the *enriched acapulcoite* LEW86220) of a feldspar-rich partial melt. The distinction (dotted vertical lines) between *primitive*, *typical*, and *transitional acapulcoites* is defined by Se concentrations of >12-13 ppm, ~5-12 ppm, and <5 ppm, respectively. The separation (horizontal dotted line) of acapulcoites from lodranites is based on K abundances of <200 ppm observed for the latter group. The assignment of members of the acapulcoite-lodranite clan according to this scheme, however, may not be exclusively inferred from their bulk chemical composition but should take into account petrographic attributes as well.

References: [1] McCoy T. J. et al. (1996) *GCA, 60,* 2681–2708. [2] McCoy T. J. et al. (1997) *GCA., 61,* 623-637. [3] Takeda H. et al. (1994) *Meteoritics, 29,* 830-842. [4] Mittlefehldt D. W. (1996) *GCA, 60,* 867-882. [5] McCoy T. J. et al. (1993) *Lunar Planet. Sci.XXIV,* 945-946. [6] Floss C. (2000) *Meteorit. & Planet. Sci., 35,* 1073-1085.