

BENCUBBIN, KAKANGARI, TUCSON AND RENAZZO: A SPECULATIVE CONNECTION BETWEEN SOME OF THEIR MAJOR COMPONENTS. M. Prinz¹, M.K. Weisberg^{1,2}, C.E. Nehru^{1,2}, J.S. Delaney¹. (1) Amer. Museum Nat. Hist., NY, NY 10024. (2) Brooklyn College (CUNY), Brooklyn, NY 11210.

We have studied the major host silicate portions (previously called "aubritic", etc.) of the "unique" Bencubbin melange and found some clasts to consist totally of remarkable, large, barred olivine (BO) texture. These are the coarsest-grained clasts, with olivine crystals up to 1 cm long. Other host silicate clasts have extremely fine-grained textures resembling cryptocrystalline chondrules. Bulk analyses of 9 large clasts, of all textural types, show near-identical compositions indicating that the only differences between the clasts are textural (varying degrees of rapid cooling). The major element composition is chondritic, and similar to that of BO chondrules [1], except for having highly depleted alkalis (volatile elements). Modal analysis of two BO-textured clasts is also typically chondritic, with: 40.3% ol (Fo 97), 38.6% opx (Wo 1, En 97), 8.0% aluminous cpx (Wo 43, En 55, 9-11.5% Al₂O₃), 12.6% plag glass (highly calcic), and 0.5% kamacite. The mineral compositions are characteristic of carbonaceous chondrites. Thus, petrologic data on the host silicate clasts are all consistent with a specific type of carbonaceous chondritic material with BO, or finer-textured, character.

Kallemeyn et al. [2] also concluded that the host silicates are carb. chondritic, and are related to the CI-CM-CO clan, with volatile abundances lower than those in CO chondrites. Oxygen isotopes [3] are consistent with a carb. chondritic classification, and Bencubbin plots on an extrapolation of the mass fractionation line from C2 matrix material (Fig. 1). Clayton and Mayeda [3] also noted the similar isotopic composition of Kakangari (Fig. 1), another "unique" carb. chondrite [4]. Kallemeyn et al. [2] argued that Kakangari is not representative of the Bencubbin host silicate parental material because it is more oxidized and has a higher volatile content. Nehru et al. [4] argued that Kakangari contains mainly one component, mafic magnesian chondrules and a matrix which is very similar, and contains very few other components typically found in carb. chondrites. Its "uniqueness" is due to having mainly one component. The Bencubbin (and Weatherford) host silicates are also "unique" in that they represent one chondritic component having BO- or finer-grained textures. We argue that Kakangari is not parental to Bencubbin, but is a different, but related carb. chondritic component.

Oxygen isotopes have also been determined for different components of Renazzo (and Al Rais), the CR chondrites [5], and the silicate inclusions in the Tucson iron [R.N. Clayton, pers. comm., 1983]. The mafic chondrule component of Renazzo (R in Fig. 1) and the Tucson silicates (T) are remarkably similar in oxygen isotopes and both are close to the same line containing Bencubbin (B) and Kakangari (K). Renazzo has other components (some hydrous) with different oxygen isotopes and the CR chondrites are considered a "unique" melange. Tucson is unique and its relationship to the other meteoritic groups is obscure. Thus, each of these four "unique" meteorites, or groups, have oxygen isotopic compositions for the selected components that are fairly close, indicating they may be related. Each also contains highly reduced carbonaceous chondritic components (chondrules, clasts, or inclusions) that have relatively similar petrologic characteristics.

The question arises, even if speculative, as to the possible relationships of any or all of these four "unique" carb. chondritic

BENCUBBIN, ETC.
Prinz, M. et al.

components. Petrologic data for Bencubbin BO-textured host silicates are presented here, and those for the Kakangari [3] and Renazzo chondrules [6], and Tucson silicate inclusions [7] have been reported earlier. Some of the petrologically similar characteristics of the silicates in the selected components of all 4 meteorites, or groups, are: (1) The silicates are all highly reduced mafic chondritic assemblages. Tucson is the most reduced (Fo 99.8), followed by Renazzo (Fo 97-99), Bencubbin (Fo 97) and Kakangari (Fo 94-96). (2) All are carbonaceous chondritic, although this was not initially recognized by Nehru *et al.* [7] for the silicate inclusions in Tucson. The oxygen isotopic data made this clearer. (3) Modally, all have chondritic assemblages with mainly ol (27-66%) and opx (30-47%), and lesser cpx (3-16%) and anorthitic plag or plag glass (1-13%). (4) Major element compositions for the selected components in all 4 meteorites, or groups, are similar and chondritic. Tucson has the most unusual composition, with major volatile depletion. The sequence Kakangari-Bencubbin-Renazzo-Tucson is one of increasing volatile depletion. This is the same sequence as that of increasing degrees of reduction. Trace element, isotopic, rare gas, and other relevant data have not yet been compared, but will be considered.

Conclusions. Selected silicate components in the four "unique" meteorites, or groups, discussed may have related histories. Clearly, these components are not identical, but their general petrologic and oxygen isotopic similarities may be indicative of a common origin in a specific region of the solar nebula undergoing evolutionary changes. Each of the selected components in the 4 meteorites, or groups, may represent a stage in this sequence. Perhaps the differences between the components reflect late parent body modifications of the original material and are more related to redox exchanges. While these relationships are admittedly speculative, further data on these specific components (rather than whole rock) may be useful in testing the hypothesis.

References. [1] Weisberg, M.K., 1987, Proc. 17th LPSC, in press. [2] Kallemeyn, G.W. *et al.*, 1978, GCA 42, 507-515. [3] Clayton, R.N. and T.K. Mayeda, 1978, GCA 42, 325-327. [4] Nehru, C.E. *et al.*, 1983, Meteoritics 18, 361-362. [5] Clayton, R.N. and T.K. Mayeda, 1977, LPS XVII, 193-195. [6] Prinz, M. *et al.*, 1985, LPS XVI, 677-678. [7] Nehru, C.E. *et al.*, 1982, Proc. 13th LPSC, JGR 87, 365-373.

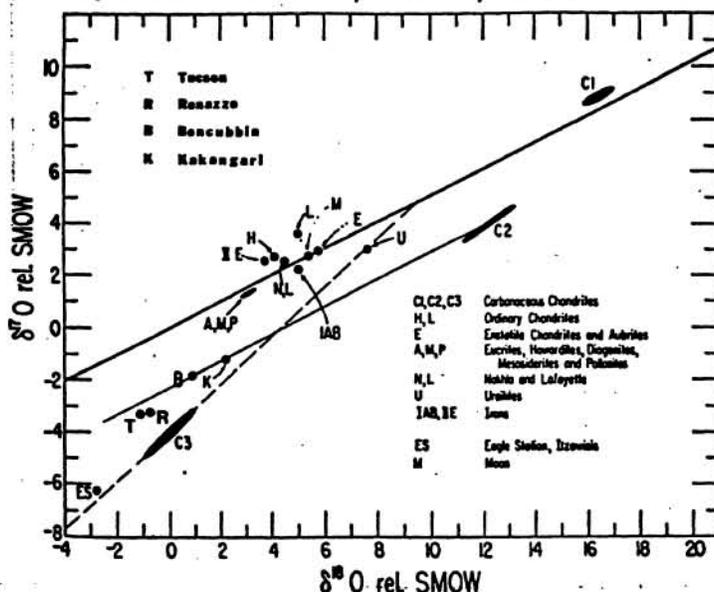


Fig. 1 Oxygen isotopic relationships.