MODIFICATION OF THE VAN SCHMUS & WOOD PETROLOGIC CLASSIFICATION FOR LITHIC FRAGMENTS IN THE CHONDRITIC BRECCIA RUMURUTI. J. Berlin[1] and D. Stöffler[2], [1]Institute of Meteoritics, University of New Mexico, Albuquerque, NM 87131, U.S.A. (jberlin@unm.edu), [2]Institut für Mineralogie, Museum für Naturkunde, Invalidenstrasse 43, D-10115 Berlin, Germany.

Introduction: The Van Schmus & Wood petrologic types 1 to 6 are commonly used to indicate the degree of aqueous alteration and thermometamorphism which chondritic meteorites experienced on their asteroidal parent body [1-3]. Ordinary as well as enstatite chondrites occur in petrologic types 3 to 6, with type 3 representing the most primitive (*and therefore precursor?*) material and type 6 representing the most strongly metamorphosed material. Features associated with aqueous alteration (type 2 and 1) are observed in carbonaceous chondrites; only the CK chondrites are thermally metamorphosed [4, 5]. To make the Van Schmus & Wood petrologic types applicable to the latter, slight modifications of some criteria were suggested by [4]. In this study, we want to show similarly how the petrologic types can be applied to lithic fragments in the breccia Rumuruti which represents the R chondrite group (only fall of this group [6]).

Results: Rumuruti contains fragments of petrologic type 3, 4, 5, and 6 (Fig. 1); also present are "shock-blackened" [7] lithologies. In Table 1 modified and additional criteria for the application of the Van Schmus & Wood petrologic types to the lithic fragments in Rumuruti are listed.

The main difference to metamorphosed ordinary chondrites is, that in Rumuruti no low-Ca pyroxene is observed in fragments of petrologic type 5 and 6. The pyroxene compositions of all petrologic types are shown in Fig. 2. The lower Ca content of pyroxenes in type 6 compared to type 5 can be explained by the fact that the pyroxene solvus narrows with increasing temperature [8], that is, the Ca content of high-Ca pyroxene decreases while that of low-Ca pyroxene would increase if present. The behavior of plagioclase is shown in Fig. 3. In fragments of petrologic type 3 feldspar-normative glass can be found within chondrules and also in the fine-grained, porous matrix. In type 4 plagioclase crystals form large isolated intergrowths (up to 200 µm) which seem to develop into networks in type 5 and 6. The feldspars of type 4, 5, and 6 have a composition of $Ab_{74\text{-}90}An_{5\text{-}23}Or_{2\text{-}9}$. While sulfide grains (FeNi-metal is very rare in R chondrites) in type 3, 4, and 5 are evenly distributed within a fragment, a mobilization and concentration in certain regions is visible in the type 6 fragments (note the distribution of dark grains within the fragments in Fig. 1).

Discussion: Our observations show that it is possible that the precursor material of petrologic type 5 and 6 in Rumuruti is not the type 3 material found in the same sample. The main reason is the lack of low-Ca pyroxene in type 5 and 6. This leads to the assumption that the precursor material of the type 5 and 6 fragments in Rumuruti was richer in Ca or that the type 3 material in general was very heterogeneous with respect to the Ca content and the presence of low-Ca pyroxene. Our suggested modified criteria for the application of the Van Schmus & Wood petrologic types to Rumuruti are supported by observations made in other R chondrites [9].

References: [1] Van Schmus W. R. & Wood J. A. (1967) *GCA*, **31**, 747-765. [2] Wasson J. T. (1985) Meteorites: Their record of early solar-system history. Freeman, New York, 267 p. [3] Brearley A. J. & Jones R. H. (1998) In: Planetary materials (ed. J. J. Papike), pp. 3-1 to 3-398. *Reviews in Mineralogy*, **36**, Min. Soc. Am., Washington, D.C., USA. [4] Kallemeyn G. W. et al. (1991) *GCA*, **55**, 881-892. [5] Scott E. R. D. & Taylor G. J. (1985) *Proc. 15th LPSC*, *JGR*, **90** Suppl., C699-C709. [6] Schulze H. et al. (1994) *MAPS*, **29**, 275-286. [7] Stöffler D. et al. (1991) *GCA*, **55**, 3845-3867. [8] Lindsley D. H. (1983) *Am. Min.*, **68**, 477-493. [9] Kallemeyn G. W. et al. (1996) *GCA*, **60**, 2243-2256.

Table 1: Modified* and additional[§] criteria for the application of the Van Schmus & Wood petrologic types to Rumuruti.

	3	4	5	6
Homogeneity of olivine*	> 5% mean deviation	homogeneous		
Pyroxene*	predominantly low-Ca pyroxene	low-Ca and Ca-rich pyroxene	only Ca-rich pyroxene present	
Feldspar*	small glassy inter-growths (< 20 µm)	isolated intergrowths (up to 200 µm)	networks start to form	well-developed networks
Sulfides[§]	evenly distributed			mobilization

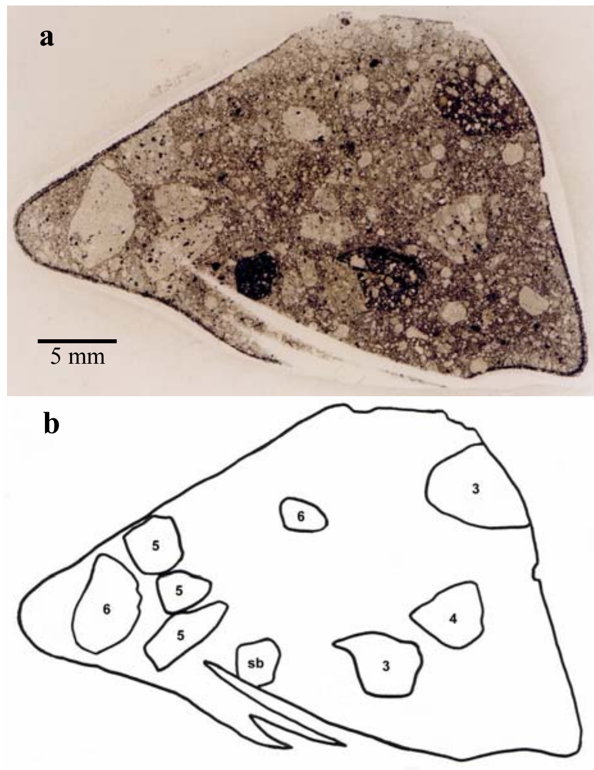

Fig. 1: a. Transmitted light photograph of a Rumuruti thin section. b. Sketch map indicating the petrologic type of the fragments. sb = shock-blackening.

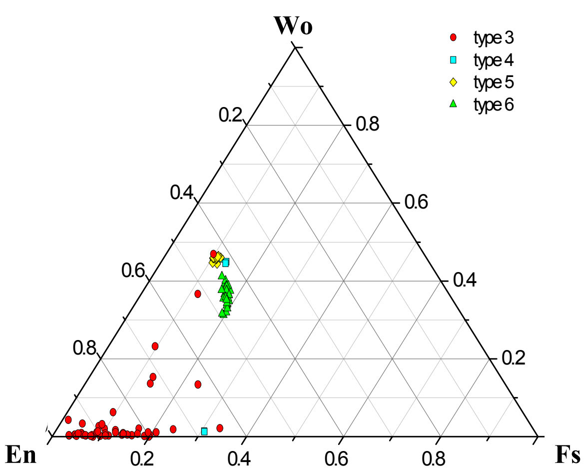

Fig. 2: Pyroxene compositions in Rumuruti fragments of different petrologic type.

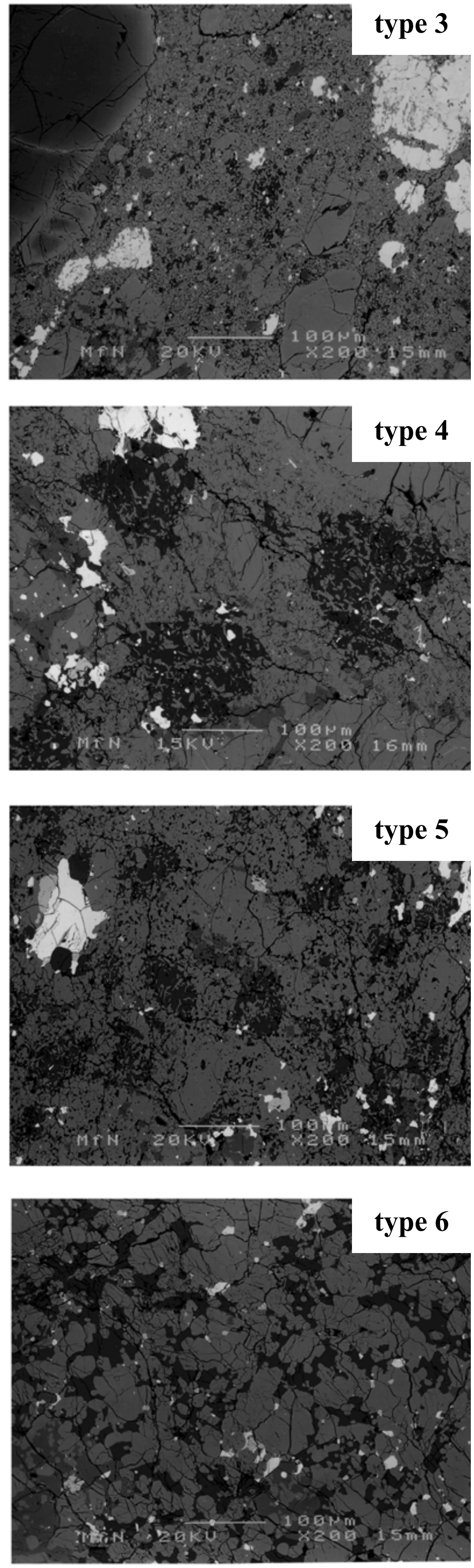

Fig. 3: This sequence of BSE images of Rumuruti shows representative regions in fragments of petrologic type 3 to 6. Pictures are taken with the same magnification to show the size and behavior of feldspar (dark phase). Olivine and pyroxene are the gray phases, sulfides are white and chromites lighter gray.