ARE MCCs DHOFAR 225 AND DHOFAR 735 OF CM3-TYPE? M.A. Ivanova[1], L.V. Moroz[2], M. Schmidt[3,4], U. Schade[4], F. Brandstaetter[5], M.A. Nazarov[1] and G. Kurat[5]. [1]Vernadsky Institute of Geochemistry and Analytical Chemistry, Kosygin St. 19, Moscow 119991, Russia (venus2@online.ru). [2]German Aerospace Center, D-12489 Berlin, Germany. [3]Heidelberg University, D-69120 Heidelberg, Germany. [4]BESSY GmbH, D-12489 Berlin, Germany. [5]Natural History Museum, A-1014, Vienna, Austria.

Introduction: Dhofar 225 and Dhofar 735 are metamorphosed carbonaceous chondrites (MCC) with some similarities to the Antarctic MCCs Belgica -7904 (CM) and Yamato - 86720 (CM) [1]. Based on our previous data and new results obtained using in situ synchrotron IR microspectroscopy (SIRM) we discuss the possible genesis of Dhofar 225 and Dhofar 735 by dehydration of matrix phyllosilicates. In addition, we studied a new Ca,Fe-oxysulfide [2].

Results: In texture and petrography, Dhofar 225 and Dhofar 735 are similar to CM chondrites [1]. However, Dhofar 225 contains the first Ca,Fe-oxysulfide found in nature [2]. Its best-fit stoichiometry and low analytical total indicate a formula of $(Ca_{4.66}\ Fe^{2+}_{0.34})5Fe^{3+}_{6}S_5O_9$. Another possible formula is $Ca_4Fe^{2+}_{5}S_4(OH)_4O_3$, but the Ca,Fe-oxysulfide inclusions appear to lack OH because they are stable under the electron beam. Moreover, absorption bands of structural OH at 2.7 µm were not detected in these grains by SIRM.

Matrices of Dhofar 225 and Dhofar 735 are very fine-grained, similar to the MCC's, they have high EPMA totals, are depleted in Fe and S, and contain small grains of olivine, troilite, taenite, and tetrataenite [1,2]. The bulk composition of Dhofar 225 is low in H_2O (1.76 wt.%) and Fe.

No signatures of O-H bonds (in structural OH and/or bound H_2O) at 2.7-3 µm were detected in the Dhofar 225 and Dhofar 735 matrices by SIRM, suggesting a lower content of hydrated phases, phyllosilicates and tochilinite, as compared to those in CMs. The O-H absorption bands were identified by SIRMs in the matrix spectra of CMs Cold Bokkeveld, Murray and Mighei, and in tochilinite inclusions of Murray, studied for comparison. Further evidence for the dehydrated state of the Dhofar 225 and Dhofar 735 matrices is the position and shape of strong bands around 10 µm due to Si-O vibrations, being consistent with fine-grained Fe-rich olivine. The positions and shapes of the Si-O bands in the IR spectra of the typical CM2 matrices are different, being consistent with mixtures of Fe-rich and Mg-rich phyllosilicates.

Discussion: Dhofar 225 and Dhofar 735, the first non-Antarctic MCC meteorites, expand the MCC group and have similar oxygen isotopic compositions (Fig. 1) [2]. They apparently have experienced heating after aqueous alteration. No water-bearing mineral was detected in their matrices, indicating that phyllosilicates were dehydrated. The materials were heated above 245 °C, since tochilinite disintegrates into troilite and oxides at 245 °C. The absence of this phase distinguishes MCCs from CMs. The presence of dolomite in Dhofar 225 and Dhofar 735 indicates an upper limit of the temperatures reached of ~700 °C. Although all MCCs underwent aqueous alteration followed by heating to different degrees [3], they may be considered as CM3 chondrites according to the general characteristics of the petrological type 3 chondrites. However, the meteorites differ from CMs also in the bulk abundances of some refractory, (enriched in Ti and Al), siderophile (depleted in Ni and Fe), and moderately volatile elements (enriched in P and K). It is unlikely that these differences in bulk chemistry are the result of metamorphism. Therefore Dhofar 225 and Dhofar 735, as well as MCCs, may represent a separate group of carbonaceous chondrites of type 3 (also supported by oxygen isotopes [2]) Fig. 1.

References: [1] Ivanova M.A. et al. 2003. *Meteoritics & Planet. Sci.* 38:A28; [2] Ivanova M.A. et al. 2002. 33th Lunar Planet. Sci. Conf. #1437 CD ROM. [3] Tonui et al. 2002. Antarct. Meteorit. Res. 15: 38-58.

Fig. 1. **Oxygen isotopic compositions**