MAGMATIC AND UNUSUAL INCLUSIONS IN OLIVINE GRAINS IN THE DAR AL GANI 735 SHERGOTTITE Y. Ikeda, Ibaraki University, Mito 310, Japan. (ikeda@mito.ipc.ibaraki.ac.jp)

Introduction: The Dar al Gani (DaG) 735 meteorite is a basaltic shergottite with a porphyritic texture, consisting mainly of olivine (Ol) megacrysts, with millimeter sizes, and fine-grained basaltic groundmass. The Ol megacrysts have chemical zoning from magnesian core ($Fo_{\sim 75}$) to ferroan rim ($Fo_{\sim 60}$), and they contain magmatic inclusions and unusual pyroxene (Pyx)-chromite (Chm) inclusions, as well as normal mineral inclusions. The groundmass has grain sizes of a few tens to hundreds of micrometers across, and the constituent minerals are low-Ca pyroxene, augite, plagioclase glass, chromite, ilmenite, phosphate, and sulfide. The low-Ca pyroxene has chemical zoning from magnesian orthopyroxene ($En_{82}Wo_2$) to ferroan pigeonite ($En_{56}Wo_{12\sim 14}$), and the pigeonite is a dominant groundmass mineral. Plagioclase glass occurs as an interstitial phase in the groundmass and shows chemical zoning from calcic core ($An_{\sim 70}$) to sodic rim ($An_{\sim 50}$). Chromite also has chemical zoning from Cr-rich core to Ti-rich rim. Calcite veins, with several to a few tens of micrometers in width, run through the meteorite, and they are terrestrial weathering products. DaG 735 has similar properties with other Libyan shergottites, DaG 476/489/670, and seems to be paired with them [1,2,3,4].

Unusual Inclusions: Unusual Pyx-Chm inclusions occur in Ol megacrysts ranging from $Fo_{\sim 75}$ to $Fo_{\sim 62}$. Among them, unusual inclusions which occur in magnesian olivine (Fo_{75} to Fo_{68}) are larger, 10~30 µm across, and consist of orthopyroxene (Opx) and Ti-poor chromite. The volume ratios of the Opx and Chm in the inclusions are nearly constant, with about 70% Opx and 30% Chm in average. The inclusions show strange textures in which Opx contains anhedral worm-like Chm grains. Unusual inclusions occurring in intermediate olivine ($Fo_{\sim 70}$ to $Fo_{\sim 62}$) are smaller, 5~10µm across, and consist of low-Ca Pyx and rounded Chm grains. The low-Ca Pyx is Opx in magnesian olivine and pigeonite in ferroan olivine. The unusual Pyx-Chm inclusions may have produced by decomposition of Cr-olivine components in the original Ol megacrysts, suggesting that the megacrysts have a xenocryst origin.

Magmatic Inclusions: Magmatic inclusions, 10~70µm across, occur in ferroan olivine grains (Fo_{62} to Fo_{60}). They have glass as the main phase with variable amounts of fassaite (Fas), and are classified into two types, inclusions without Fas mantle (type I) and with the Fas mantle (type II), which surrounds the inclusions. The type I magmatic inclusions consist mainly of clean glass (type I glass) with minor Fas needle crystals. The type I glass has been produced from a trapped melt (L_1) by subtraction of wall olivine that lined the wall of the inclusions and minor quenched Fas needle crystals. Type II inclusions consist of devitrified glass (type II glass), subrounded silica mineral grains, and Fas needle crystals, in addition to the Fas mantle. The type II glass may have formed from a trapped melt (L_1) by precipitation of wall olivine, wall Fas, Fas needle crystals, and silica mineral.

Summary: The DaG 735 meteorite is paired with other Libyan shergottites, DaG 476/489/670. The magnesian olivine megacrysts contain unusual Pyx-Chm inclusions, suggesting that they have a xenocryst origin. However, smaller ferroan olivine grains contain magmatic inclusions, suggesting that they are phenocrysts. Crystallization trends of silicate melts in the magmatic inclusions differ from the main crystallization trend of the host DaG 735 lithology.

References: [1] Grossman J.N. (2000) Meteorit. Planet. Sci. 35 (Suppl.), A199-A225; [2] Folco L. and Franchi I.A. (2000) Meteorit. Planet. Sci. 35 (Suppl.), A54-A55; [3] Wadhwa M., Lentz R.C.F., McSween H.Y., and Crozaz G. (2000) Meteorit. Planet. Sci. 36, 195-208; [4] Mikouchi T., Miyamoto M., and McKay G.A. (2001) Meteorit. Planet. Sci. 36, 531-548.