STUDY OF CHONDRULE FORMATION MECHANISMS FROM MELTS GENERATED EXPERIMENTALLY. P. Hernández-Reséndiz[1] , K. Cervantes-de la Cruz[2] and A. Segura[1], A. U'ren[1], H. Cruz-Ramirez[1], R. Ramirez-Alarcon[1]. [1]Instituto de Ciencias Nucleares, Universidad Nacional Autónoma de México, Circuito Exterior C.U. A. Postal 70.543 04510 México D. F., patricia.hernandez@correo.nucleares.unam.mx, [2]Facultad de Ciencias, UNAM, karina-cervantes@ciencias.unam.mx

Introduction: Meteorites are samples of early processes in the protoplanetary disk where the Solar System was formed. Chondrites have the oldest components of the Solar System. Chondrules are the main component of chondrites and they are among the most primitive materials in the Solar System: 4567-4565 Myr [1]. The range of chondrule formation is 1-3 Ma. They are compoused of olivine $(Mg,Fe)_2SiO_4$ and poor Ca pyroxene $(Mg,Fe)SiO_3$. They were formed under low pressure, in relatively reducing conditions [2] and at temperatures in the range of 1200 – 1750 °C in the course of seconds and at most several minutes [3].

The important unknowns in the formation of chondrules are:

- The starting composition of the precursors.
- The physical conditions of their formation (pressure, temperature and time).
- The mechanisms that produce them.

The main aspects of chondrules are:

1. The retention of volatile materials such as S, Na and K, wich had not survived heating and/or cooling for long periods of time.
2. The existence of grains and edges indicating different heating pulses, instead of monotonic cooling after a single heating.

It is not known what is the precise mechanism of heating of chondrule precursors. The most accepted model is "flash heating", originated by shockwave fronts propagating through the interior of the solar nebula [4].

The thermal histories provide the most important information in the chondrule formation, therefore the constrains on thermal histories are keys to find the processes that originated chondrules [5].

Objectives: There are two main objectives:

- To determine what kind of heating conditions reproduce the features observed in chondrites meteorites.
- To associate the experimental results with chondrule formation models, in order to constrain conditions of the disk that gave rise to the Solar System.

Methodology: We will simulate the formation of barred olivine chondrules by melting olivine crystals at high vacuum conditions using a 50 W CO_2 laser emitting in the infrared at a wavelength of 10.6 μm (see figure 1). We will measure the temperature during and after the melting. Each melt will have a thermal history recorded.

Subsequently, we will be perform petrological, chemical, crystallographic and textural analysis of the melts. These set of analysis will be compared with the natural chondrules. The thermal histories of those experimental melts that reproduce the characteristics of natural chondrules will be used to constrain the scenarios of chondrule formation and the physical conditions of the solar nebula.

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Figure 1. Experimental device.