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Optical Properties of Non-Stoichiometric Amorphous Mg-Fe Silicates

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Dust grain formation in circumstellar environments takes place under non-equilibrium conditions. Hence, the resultant dust grains are composed of non-stoichiometric compositions. In fact, an amorphous non-stoichiometric presolar silicate grain from the carbonaceous chondrite Acfer 094 has been reported by the TEM analysis [1]. However, formation mechanisms and evolution processes of non-stoichiometric silicates have not been well understood yet. Thus we investigated changes in the optical properties of amorphous olivines with different Mg and Fe ratio ($Mg/(Mg+Fe)$) in order to deepen the understanding of the effect of metals on the vibration bands of silicates by making use of FTIR spectrometer and IR ellipsometer. The amorphous silicates were fabricated on Si-wafers by means of PLD technique [2]. The thin film stoichiometry was determined by RBS spectroscopy. The results will improve analysis of the nature and composition of the silicate dust in protoplanetary disks as well as circumstellar shells.

[1] Nguyen, A.N. et al. (2007) ApJ 656, 1223–1240. [2]
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