

# The systematic study of a 65 micron emission feature in the interstellar space - Detection of a crystalline silicate feature? -

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We report the detection of a dust feature around 65 micron in the far-infrared spectra of the interstellar emission. The spectra were taken by the Long-Wavelength Spectrometer (LWS) on board Infrared Space Observatory (ISO). The feature has been reported first for two active star-forming regions, the Carina Nebula and Sharpless 171 (S171). A similar 65 micron feature has been detected in evolved stars and a Ca-bearing crystalline silicate, diopside ( $\text{CaMgSi}_2\text{O}_6$ ), has been proposed as a possible carrier. The spectra of the two star-forming regions have also been well fitted with diopside.

We examine the spatial distribution of the 65 micron feature in those star-forming regions as well as in other HII regions, reflection nebulae, and the diffuse interstellar space observed by ISO and detect the 65 micron feature in several regions. As a carrier of the observed feature, we examine two candidates: one is crystalline water ice and another is diopside. Either of them provide key information about the heating history that dust grains experienced. The results of the examination of the detected feature are: (1) the feature has its peak around 65 micron or longer and is well fitted by diopside, whereas the peak of the crystalline water ice feature is at 62 micron, clearly shorter than the [OI]63 micron line, (2) the abundance of O in water ice or Ca in diopside derived from the strength of the feature is well below the solar abundance, and (3) the feature is absent in high temperature regions despite the high S/N of the spectra and the strength of the feature against the continuum decreases as the temperature increases, indicating that the carrier is volatile material. We further discuss the correlation of the central wavelength of the feature with the temperature and the relation with a very broad feature around 100 micron, and summarize the properties of the 65 micron feature and the possible carrier.