Abstract

Studying the composition of dust in the ISM is crucial in understanding the cycle of dust in our galaxy. Interstellar dust mainly consists of amorphous silicates, which are responsible for two strong absorption features at about 10 and 18 $\mu$m in the infrared spectra observed towards stars with a lot of interstellar dust in front of them.

In order to also study the less abundant dust species we submitted an observing proposal for the NASA Spitzer space telescope on February 15, 2007, to request high quality spectra of heavily extincted, bright, preferably early type background sources. This proposal was accepted by the Spitzer science center on May 3, 2007 with 21.0 hours of scheduling priority 2 (medium). The analysis of these observations is beyond the scope of this thesis.

We have analyzed 12 spectra from the Spitzer archive. For 7 spectra, of which 3 are diffuse and 4 molecular lines of sight, we have looked at the 10 micron silicate feature. The shape of the 10 micron silicate feature is strikingly similar for the diffuse sight lines, but the molecular sight lines show differences. The most likely explanation is an increase in the abundance of pyroxenes in molecular clouds.

Furthermore, we have compared the strength of the 10 micron silicate feature, $\tau_{9.7}$, with the near infrared color excess, $E(J-K)$, mainly caused by graphite. For the diffuse ISM there is a tight linear correlation between these two parameters, but for the molecular sight lines this correlation fails. This is most probably caused by an increase in $E(J-K)$ and a possible explanation is the formation of FeS out of metallic iron and gas phase sulfur in molecular clouds.

For 6 spectra, which are all diffuse sight lines, we have looked at the 18 micron silicate feature. The shape of this feature shows differences for the different diffuse sight lines, indicating that the composition of dust in the diffuse ISM is not entirely the same everywhere in our galaxy. The explanation for the observed differences, however, remains uncertain.