

# Chemistry in protoplanetary disks with the effects of the grain growth

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Planetesimals are thought to be formed in protoplanetary disks as a result of grain growth, but many uncertainties are still remained in this process. So observations of disks in transient period which has large grain are good for understanding planetesimal formation. Observational instruments are developed recently like ALMA, and theoretical study of these disks become important.

In this study, we calculate the chemistry and radiative transfer to investigate the influences of the grain growth on chemical structure of protoplanetary disks. In the case of large grains, FUV radiation can penetrate near the midplane because of the low opacity, and that changes the gas temperature. As a result, most molecules are abundant near the midplane compared with the case of small grains.

The results of calculations of radiative transfer are shown in Figure 1. Line of CO3-2 is optically thick even in the case of small grain, so in the case of large grains, intensity of CO3-2 line is not much different from the case of small grain. On the other hand, intensity of CN3-2 line change greatly with the case of small grains and large grains. Line of CN3-2 is optically thin in the case of small grain, but CN are abundant in the high density region(midplane) in the case of large grains, so CN3-2 line is changed to optically thick.

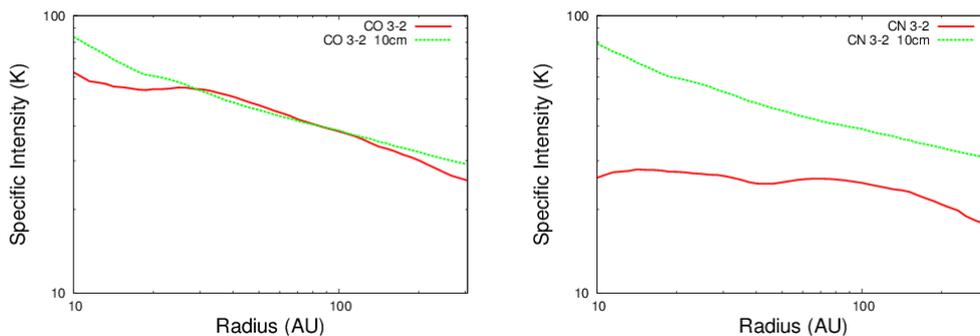


Figure 1: Specific intensity as a function of radius; red line indicates the case of small grain, and green line indicates large grain; (Left): CO 3-2, (Right): CN 3-2