CHEMISTRY IN THE MOLECULAR DISKS OF ACTIVE GALACTIC NUCLEI

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Active galactic nuclei (AGNs) are the centers of galaxies with supermassive blackholes whose accretion of mass causes very high luminosities of $L \sim 10^{44-46}$erg s^{-1}. An accretion disk has a molecular component that extends to hundreds of pc from the central AGN core. The question of how much central illumination affects the disk and how much star formation is present near the core have been astrophysical interests. Rotational lines from these disks at a sub-kpc scale have been observed for molecules such as CO, HCO^+, HCN, and HNC. When ALMA becomes fully operational, it will be able to resolve these disks at much higher resolution than currently. Molecular observations at higher resolution may give some hints on the physics in the molecular disk. We modeled the chemical composition of a molecular disk in an AGN on a scale of tens of pc. To do this, we extended our standard gas-phase OSU network to include important processes at much higher temperatures, approaching 1000 K. We used the density model of Thompson et al.[a], and determined the temperature by the blackbody approximation from the luminosity of the AGN core. The ionization by X-rays from the AGN core, by cosmic-rays from the AGN core, supernovae and stellar winds, and by UV-photons from OB stars are considered. We will briefly mention the effects from other factors that may change the molecular abundances such as shock waves and inhomogeneity of the density of the disk.

[a] T. Thompson, E. Quataert, and N. Murray, Astrophysical J. 630, 167 (2005)