MOLECULAR ABUNDANCES IN THE DISK OF AN ACTIVE GALACTIC NUCLEUS

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There are galactic nuclei that emit high luminosities L$\sim 10^{44-46}$ erg s^{-1} including luminosity produced by X-rays from high mass accretion onto the central black holes. These nuclei are called active galactic nuclei (AGNs), and they are accompanied by molecular disks. Observations show high abundances of CN and HCN in the disks; the molecules are proposed to be probes of X-ray dominated regions (XDRs) created by the X-rays from AGNs.[a] We have constructed a spatially-dependent chemical-abundance model of the molecular disk in NGC 1068, a typical AGN-dominated galaxy[b]. Recently, new observations of CN and HCN have been made at much higher spatial resolution[c d], and there are also detections of polyatomic molecules such as HC_3N[e], c-C_3H_2, and C_2H[f]. We discuss how these observations and our simulations can help us to better understand the physical conditions, the disk structure, and conditions for star formation within molecular disks, which are still uncertain. We also include a comparison with other types of galaxies such as (ultra-) luminous infrared galaxies.

[a] Usero et al.*Astronomy and Astrophysics.* **419** (897), 2004.
[b] Initial results were presented at the International Symposium on Molecular Spectroscopy 2010, RF05
[c] Garcia-Burillo et al. *Astronomy and Astrophysics.* **519** (2), 2010.
[d] Garcia-Burillo et al. *Journal of Physics Conference Series*, **131** (12031), 2008.
[e] Costagliola et al. *ArXiv e-print* arXiv:1101.2122, 2011.
[f] Nakajima et al. *Astrophysical Journal Letters* **728** (L38), 2008.