**Detection of $CH_3CN$ in a Diffuse Cloud by Hot Axis Effect indicating its coexistence with $C_{60}^+$, a carrier of Diffuse Interstellar Bands**

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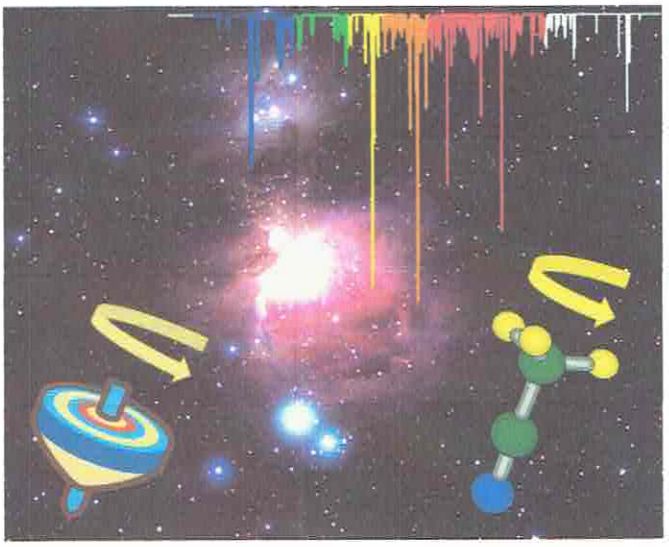
# Room: ERC 545



Diffuse interstellar bands (DIBs) are optical absorption lines by molecules in diffuse cloud. Initially observed more than 100 years ago, they still remain the longest standing unsolved problem in spectroscopy and astrochemistry, although five DIBs have recently been identified as due to fullerene ion $C_{60}^+$. Identifications of DIBs are important because they can give us information for chemical composition in space. To identify carrier molecules of DIBs we have measured DIB candidate molecules produced in the laboratory to compare their absorption spectra with astronomically observed DIB spectra. In this talk, I first present our latest results on the search for the thiophenoxy radical $C_6H_5S$ by using our cavity ringdown spectrometer.

I then present a new insight into diffuse clouds. Molecules in diffuse clouds are collisionally heated and radiatively cooled. Due to the spectroscopic selection rules, acetonitrile $CH_3CN$ is cooled well for the end-over-end rotation but is not cooled for rotation around its molecular axis. We made a model of this peculiar rotation as "Hot Axis Effect." Based on this model, we estimated a rotational absorption spectrum of $CH_3CN$ in the radio frequency region. By using Nobeyama 45 m radio telescope, the absorption line was detected in the diffuse cloud in front of Orion molecular cloud. Absorption lines of the fullerene have also been reported in this diffuse cloud. Thus we found that $CH_3CN$ coexists with $C_{60}^+$ in this diffuse cloud.

Host: Oka