Deuterated organic dust in space

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Deuterium (D) is one of the light elements created in the big bang. D is destroyed by nuclear reactions in stellar interiors, a process called astration. Its abundance is thus directly related to the primordial nucleosynthesis and the chemical evolution of the Galaxy. However, the observed D to hydrogen (D/H) ratio of the interstellar gas does not show any systematic trend with metallicity but shows a considerable scatter, which cannot be accounted by any chemical evolution models. In fact, UV observations suggest that D may be deleted onto dust grains (Linsky et al. 2006), leading to a hypothesis that missing D may be harbored in interstellar polycyclic aromatic hydrocarbons (PAHs) and 30% of PAHs may contain D (Draine 2006). While ISO/SWS observations report marginal detection of bands attributable to deuterated PAHs, suggesting that 30% of PAHs may have D in them (Peeters et al. 2004), being in agreement with the hypothesis, recent observations of AKARI put a more stringent upper limit on the content of D in PAHs as 3% (Onaka et al. 2014). Further investigations on a larger sample suggest that deuterated PAHs are not commonly present in the ISM (Doney et al. 2016). Accurate measurements of the band strengths of deuterated PAHs support the conclusion (Mori et al. in prep.), while deteronated PAHs may account for the observations (Buragohain et al. 2015). In this presentation, the latest results of AKARI observations of possible deuterated PAH features are discussed together with absorption spectroscopy of organic features in the ISM, investigating a possibility of D hiding in larger organic materials in the ISM.

Buragohain, M., et al. 2015, MNRAS, 454, 193
Doney, K. D., et al. 2016, A&A, 586, 65
Draine, B. T. 2006, ASP Conf. ser. 348, 58
Linsky, J. L., et al. 2006, ApJ, 647, 1106
Onaka, T, et al. 2014, ApJ, 780, 114
Peeters, E., et al. 2004, ApJ, 604, 252