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AKARI Near-Infrared Spectroscopy of $3\,\mu$m PAH and $4\,\mu$m PAD features in Galactic Objects

Near-infrared (NIR; 2.5–5 μm) low-resolution ($\lambda/\Delta\lambda \sim 100$) spectra were obtained for a number of Galactic and extragalactic objects with the Infrared Camera (IRC) in the AKARI warm mission. These data provide us with the first opportunity to make a systematic study of the 3.3–3.5 μm PAH features in a galactic scale as well as within an object. NIR spectra are particularly important for the study of the smallest PAHs, aliphatic side groups to PAHs, and predicted combination bands. Here we report the results of IRC NIR spectroscopy of the Galactic objects. Whereas the 3.3 μm band is well resolved in most spectra, the 3.5 μm band is not clearly separated from the 3.4 μm band in the IRC spectrum. The intensity ratio of the summation of the 3.4 and 3.5 μm bands to the 3.3 μm band shows a tendency to increase towards the Galactic center, although the scatter is large. A search for deuterated PAH features in the 4 μm region is also carried out in IRC NIR spectra. Emission lines originating in the ionized gas together with the detector anomaly hamper an accurate search at certain wavelengths, but little convincing evidence has so far been obtained for the presence of significant features in 4.2–4.7 μm. A conservative upper limit of 2–3% is obtained for the integrated intensity ratio of the 4.4–4.7 μm possible features to the 3.3–3.5 μm PAH features in the present sample of the IRC spectra.