

Aromatics and Aliphatics at Cosmic Dusk as Probed by JWST

X. J. Yang,^{1,2} J. W. Lyu³ Aigen Li²

¹ Xiangtan University, 411105 Xiangtan, Hunan Province, China

² University of Missouri, Columbia, MO 65211, USA

³ University of Arizona, Tucson, Arizona 85721, USA

The so-called “unidentified” infrared emission (UIE) features at 3.3, 6.2, 7.7, 8.6, 11.3 and 12.7 μm , commonly attributed to the stretching and bending vibrations of polycyclic aromatic hydrocarbon (PAH) molecules, are ubiquitously seen in a wide variety of astrophysical regions in the Milky Way and nearby galaxies as well as distant galaxies at redshifts $z \geq 4$. The 3.3 and 3.4 μm features which are commonly respectively attributed to aromatic and aliphatic C—H stretches have been used to explore the chemical structure, and therefore then the properties of the environment of the UIE carriers. While the 3.3 and 3.4 μm PAH emission bands are frequently seen in Galactic sources, their detections in extragalactic sources are rare and limited to only several nearby galaxies. We report the serendipitous detections of the 3.3 and 3.4 μm emission bands in over two dozen galaxies at redshift $z \sim 0.2-0.5$ with JWST NIRCcam in the GOODS-S and GOODS-N. The aliphaticity of the emitter is quantitatively derived from the 3.3 and 3.4 μm emission. We found that the aliphaticity does not appear to evolve with redshift, and the aliphaticity exhibits no correlation with the star formation rates (SFRs) and galaxy metallicity.