

S28a ALMA Observation of an Infrared-bright Dust-Obscured Galaxy with Strong Ionized Gas Outflow

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We report the discovery of an infrared (IR)-bright dust-obscured galaxy (DOG) that shows a strong ionized-gas outflow but no significant molecular gas outflow. Based on detail analysis of their optical spectra, we found some peculiar IR-bright DOGs that show strong ionized-gas outflow ($[\text{O III}]\lambda 5007$) from the central active galactic nucleus (AGN). For one of these DOGs (WISE J102905.90+050132.4) at $z_{\text{spec}} = 0.493$, we performed follow-up observations using ALMA to investigate their CO molecular gas properties. As a result, we successfully detected $^{12}\text{CO}(J=2-1)$ and $^{12}\text{CO}(J=4-3)$ lines, and the continuum of this DOG. The intensity-weighted velocity map of both lines shows a gradient, and the line profile of those CO lines is well-fitted by a single narrow Gaussian, meaning that this DOG has no sign of strong molecular gas outflow. The IR luminosity of this object is $\log(L_{\text{IR}}/L_{\odot}) = 12.40$ that is classified as ultraluminous IR galaxy (ULIRG). We found that (i) the stellar mass and star-formation rate relation and (ii) the CO luminosity and far-IR luminosity relation are consistent with those of typical ULIRGs at similar redshifts. These results indicate that the molecular gas properties of this DOG are normal despite that its optical spectrum showing a powerful AGN outflow. We conclude that a powerful ionized-gas outflow caused by the AGN does not necessarily affect the cold interstellar medium in the host galaxy at least for this DOG (Toba et al. 2017, ApJ, accepted).