X43a RIOJA. Young Starburst and Ionized Gas Outflows in a $z = 7.212$ Galaxy Uncovered by JWST NIRCam and NIRSpec Observations

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Rest-frame optical follow-up observations of ALMA-detected galaxies in the epoch of reionization are essential to study their physical properties. We present analysis of JWST NIRCam and NIRSpec observations of a galaxy at $z = 7.212$, as part of the Reionization and the ISM/Stellar Origins with JWST and ALMA (RIOJA) project. We derived the physical properties by conducting SED fitting, confirming the young starburst nature of our target. We identified multiple emission lines from NIRSpec data. The [O III]λ5008 emission has broad wings with FWHM of $\sim 630\,\mathrm{km\,s^{-1}}$, indicating the presence of ionized gas outflows. The derived mass loading factor of $\log \eta = -0.09 \pm 0.44$ implies that the outflow-driven mechanisms may quench the star formation effectively. The inferred gas depletion time of a few 100 Myr suggests that our target may be one of the progenitors of massive quiescent galaxies identified at $z \sim 4 - 5$. Distinct morphologies of optical and far-infrared [O III] implies inhomogeneous density distributions across the galaxy. Moreover, the extremely young stellar age of ~ 2 Myr can hardly account for the measured metallicity. Future MIRI observations may be necessary to probe the potential old stellar populations.