



# Chemical properties in the most distant radio galaxy

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We present a deep optical spectrum of TN J0924-2201, the most distant radio galaxy at  $z = 5.19$ , obtained with FOCAS on the Subaru Telescope. We successfully detect, for the first time, the CIV1549 emission line from the narrow-line region (NLR). In addition to the emission-line fluxes of Ly alpha and CIV, we set upper limits on the NV and H $\delta$  emissions. We use these line detections and upper limits to constrain the chemical properties of TN J0924-2201. By comparing the observed emission-line flux ratios with photoionization models, we infer that the carbon-to-oxygen relative abundance is already  $[C/O] > -0.5$  at a cosmic age of  $\sim 1.1$  Gyr. This lower limit on  $[C/O]$  is higher than the ratio expected at the earliest phases of the galaxy chemical evolution, indicating that TN J0924-2201 has already experienced significant chemical evolution at  $z = 5.19$ .

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