Quantum crystallography of Rydberg-dressed Bose gases on a square lattice\textsuperscript{1} WEN-CHIN WU, CHE-HSIU HSUEH, National Taiwan Normal University, MAKOTO TSUBOTA, Osaka City University — We numerically investigate the quantum crystallographic phases of a Rydberg-dressed Bose gas loaded on a square lattice by using the mean-field Gross–Pitaevskii model. For a relatively weak lattice confinement, the phases of ground state undergo amorphism, polycrystal, and polymorphism following the increase of the blockade radius, and if the confinement is stronger, a single crystal with a specific filling factor will be formed. In order to distintively characterize these phases, the structure function is also studied. In such an anisotropic system, we show that the superfluid-fraction tensor should be a measurable quantity, and an anisotropy parameter can be defined. In addition, for such crystallographic phases, the interaction potential can manifest where the grain boundaries appear.

\textsuperscript{1}This work was supported by JSPS KAKENHI grant numbers JP16H00807 and JP26400366 and by the Ministry of Science and Technology, Taiwan (grant No. MOST 105-2112-M-003-005).