

# Atomistic Insights on Surface Quality Control via Annealing Process in AlGaN Thin Film Growth

Qing Peng <sup>1,2,3,†</sup>, Zhiwei Ma <sup>2,†</sup>, Shixian Cai <sup>4,†</sup>, Shuai Zhao <sup>2</sup>, Xiaojia Chen <sup>1,\*</sup> and Qiang Cao <sup>4,\*</sup>

<sup>1</sup> School of Science, Harbin Institute of Technology, Shenzhen 518055, China; pengqing@imech.ac.cn

<sup>2</sup> State Key Laboratory of Nonlinear Mechanics, Institute of Mechanics, Chinese Academy of Sciences, Beijing 100190, China; mzw@lnm.imech.ac.cn (Z.M.)

<sup>3</sup> School of Engineering Science, University of Chinese Academy of Sciences, Beijing 100049, China

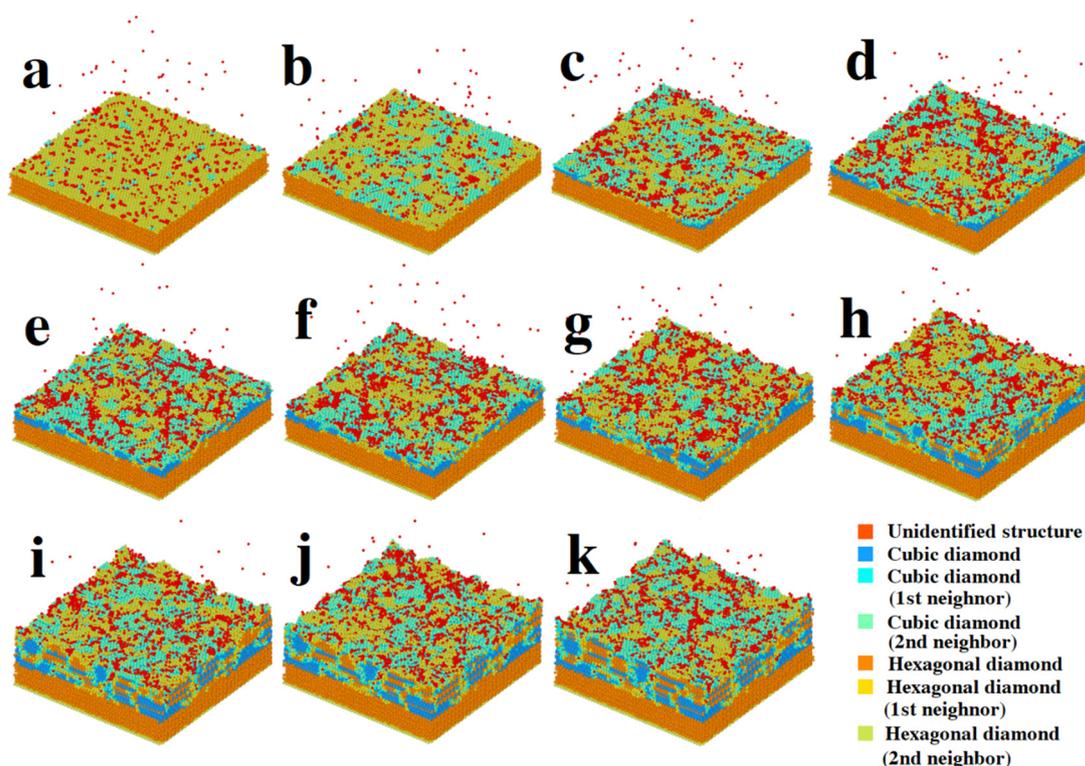
<sup>4</sup> The Institute of Technological Sciences, Wuhan University, Wuhan 430072, China

\* Correspondence: xjchen2@gmail.com (X.C.); caoqiang@whu.edu.cn (Q.C.)

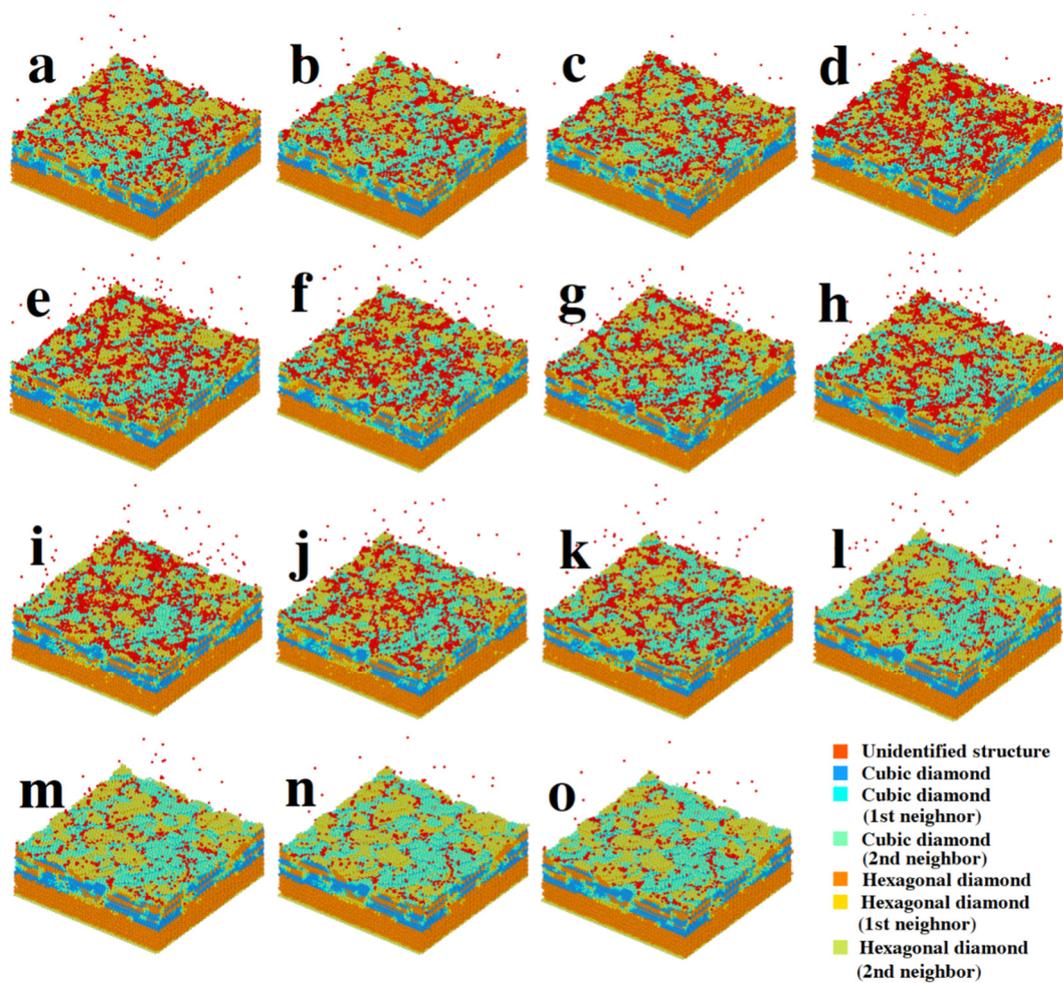
† These authors contributed equally to this work

These figures and movies are to help people have a more intuitive understanding of the film growth and annealing process.

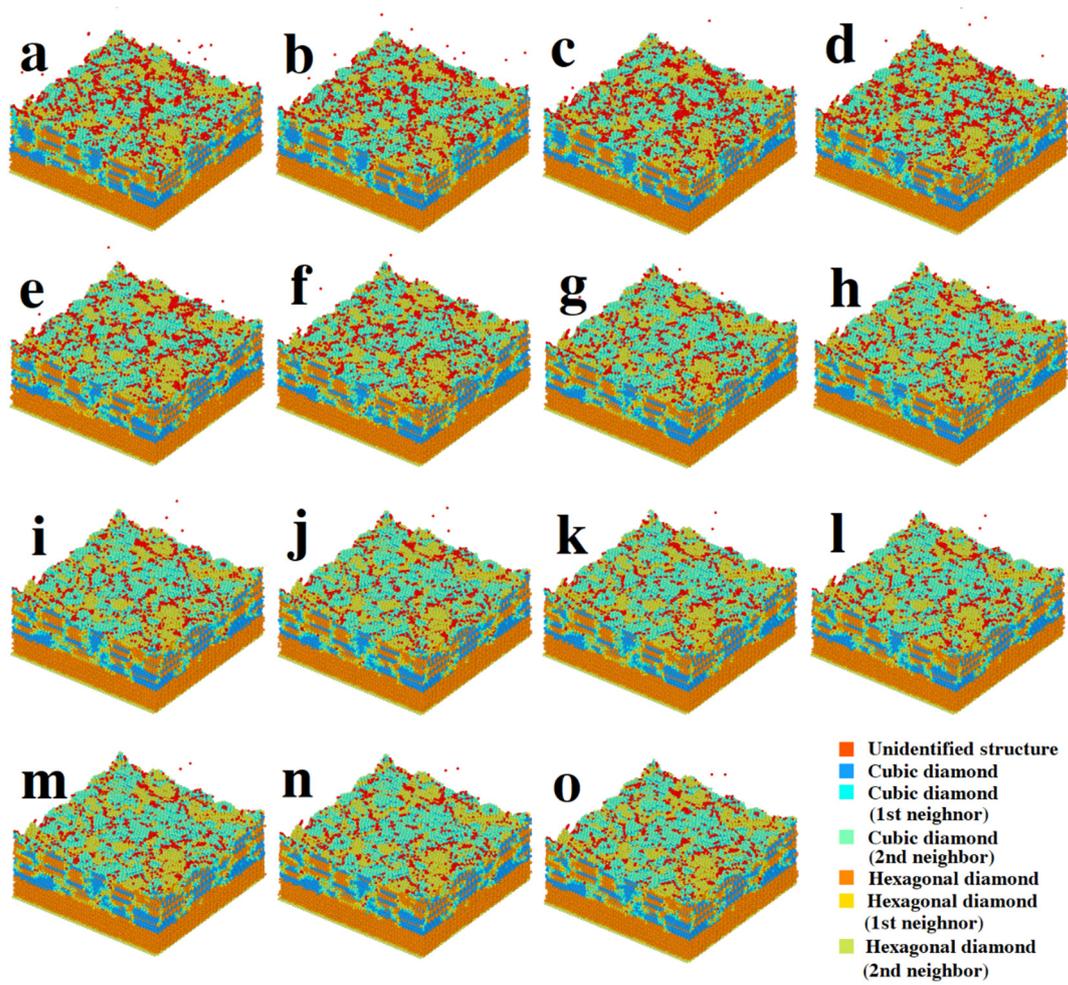
1. **Fig. S1 and Movie1** depict the growth process of AlGaN on AlN films. The number of atoms has been indicated in the introduction.
2. **Fig. S2 and Movie2** depict the entire process when the constant temperature annealing temperature is 4000 K.
3. **Fig. S3 and Movie3** depicts a partial image of the entire process of laser thermal annealing process.



**Figure S1.** Atomistic configurations of deposited AlGaN films with (a) 63656, (b) 68274, (c) 75059, (d) 82256, (e) 89455, (f) 92068, (g) 109083, (h) 127224, (i) 138736, (j) 146352, (k) 154844 atoms.



**Figure S2.** Atomistic configurations of AlGaN films at different times during annealing (4000 K). (a) 0 ps, (b) 10 ps, (c) 20 ps, (d) 32 ps, (e) 46 ps, (f) 59.5 ps, (g) 71.5 ps, (h) 84 ps, (i) 100 ps, (j) 112 ps, (k) 127 ps, (l) 135 ps, (m) 147.5 ps, (n) 153.5 ps, (o) 154 ps (end).



**Figure S3.** Atomistic configurations of AlGaIn films at different times during laser thermal annealing. (a) 0 ps, (b) 10 ps, (c) 20.5 ps, (d) 40.5 ps, (e) 64 ps, (f) 80 ps, (g) 100 ps, (h) 124 ps, (i) 163 ps, (j) 182 ps, (k) 205 ps, (l) 220 ps, (m) 252 ps, (n) 270 ps, (o) 280 ps.