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Magnetite ($\text{Fe}_{3-\delta}\text{O}_4$) homoepitaxy observed by X-ray intensity growth oscillations — •

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Processes on the $\text{Fe}_{3-\delta}\text{O}_4$ (001) surface like oxidative regrowth, (partial) lifting of the subsurface cation vacancy reconstruction and the element-specific incorporation of adatoms demonstrate the sensitive relation of oxygen pressure, cation transport and structure in the near-surface region of $\text{Fe}_{3-\delta}\text{O}_4$ influencing the performance of catalysts and devices [1,2,3]. We exemplarily studied the homoepitaxial growth of $\text{Fe}_{3-\delta}\text{O}_4$ (001) in dependence of the O_2 pressure and iron flux. X-ray intensity growth oscillations proved ordered growth of $\text{Fe}_{3-\delta}\text{O}_4$ for all probed conditions while atomic force microscopy revealed newly formed micrometre-sized surface structures exceeding the amount of deposited material [4]. Our results indicate the presence of multiple parallel processes during reactive $\text{Fe}_{3-\delta}\text{O}_4$ homoepitaxy suggesting similar processes to occur also in other applications of $\text{Fe}_{3-\delta}\text{O}_4$. [1] Nie et al., J. Am. Chem. Soc. 135, 10091 (2013), [2] Arndt, B. et al. PCCP 22, 8336 (2020), [3] Mirabella et al., Electrochimica Acta, 389, 138638 (2021), [4] van der Vegt et al., Phys. Rev. Lett. 68, 3335 (1992)

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