# Electronic Supplementary Information

## Synthesis of vertically aligned single-crystalline α-$(Fe_xCr_{1-x})_2O_3$ nanostructure arrays by microwave irradiation and their growth mechanism

Seungho Cho and Kun-Hong Lee

Department of Chemical Engineering, Pohang University of Science and Technology (POSTECH), San 31, Hyoja-Dong, Nam-Gu, Pohang, Gyungbuk, Korea, 790-784
E-mail: ce20047@postech.ac.kr

We used XPS to examine the oxidation states of Fe and Cr in the products. The Fe $2p_{3/2}$ and $2p_{1/2}$ electron binding energies are shown in Figure S1(a), which are very similar to the values reported in the literature.[S1] The binding energies at 710.8 ± 0.1 and 724.4 ± 0.1 eV were characteristic of the doublet from the Fe $2p_{3/2}$ and Fe $2p_{1/2}$ core-level electrons, respectively. No $Fe^{2+}$ shakeup satellite peaks at about 715.5 eV were observed.[S2] Thus, the Fe 2p spectrum was attributed to $Fe^{3+}$. The Cr 2p spectrum (Figure S2(b), $2p_{3/2}$) was fit to $Cr^{3+}$ at 577.3 eV while no other chromium signals were observed for the nanostructures.[S3,S4] Therefore, the chemical states of Fe and Cr in the oxide nanostructures were mainly assigned to $Fe^{3+}$ and $Cr^{3+}$.

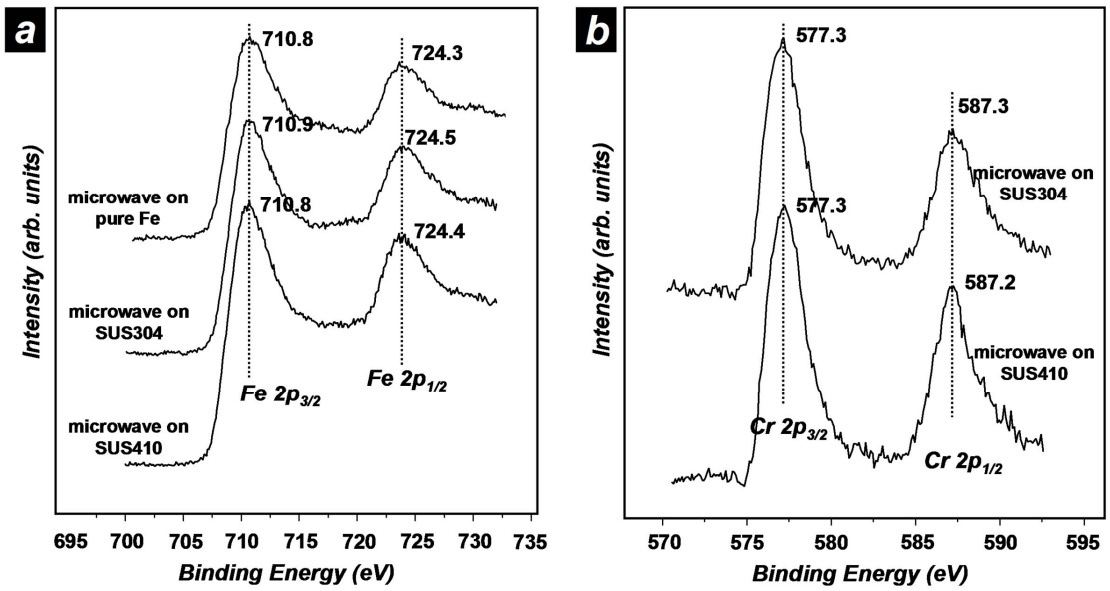


**Fig. S1.** XPS spectra of nanostructures synthesized from 1000 W microwave irradiation on substrates (pure iron, SUS304, SUS410) for 7 min: (a) Fe 2p XPS spectrum; (b) Cr 2p XPS spectrum.

## References

S1 H. Srivastava, P. Tiwari, A. K. Srivastava and R. V. Nandedkar, *J. Appl. Phys.,* 2007, **102**, 054303.
S2 S. Gota, E. Guiot, M. Henriot and M. Gautier-Soyer, *Phys. Rev. B,* 1999, **60**, 14387.
S3 R. K. Brow, *J. Am. Ceram. Soc.,* 1987, **70**, C129.
S4 I. Ikemoto, K. Ishii, S. Kinoshita, H. Kuroda, M. A. Alariofranco and J. M. Thomas, *J. Solid State Chem.,* 1976, **17**, 425.

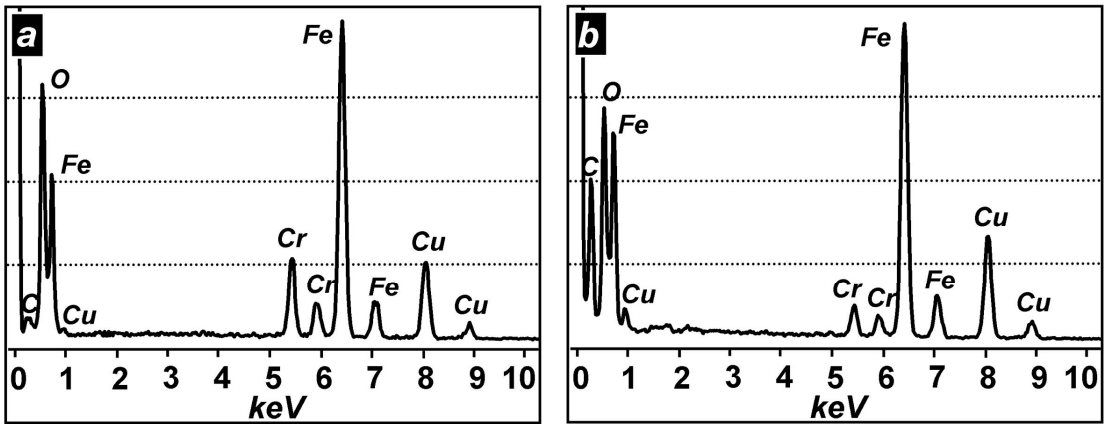


**Fig. S2.** EDX patterns of the nanostructures: (a) the nanostructures synthesized by 1000 W microwave irradiation on SUS304 for 7 min. (b) the nanostructure synthesized by 1000 W microwave irradiation on SUS410 for 7 min.