Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Supplementary Information

Crystalline Structure-Tunable, Surface Oxidation- Suppressed Ni Nanoparticles: Printable Magnetic Colloidal Fluids for Flexible Electronics

Yejin Jo,[a] Sang-Jin Oh,[a,b] Sun Sook Lee,[a] Yeong-Hui Seo,[a] Beyong-Hwan Ryu,[a] Dae Ho Yoon,[b] Youngmin Choi,[a,*] Sunho Jeong[a,*]

[a] Division of Advanced Materials, Korea Research Institute of Chemical Technology (KRICT), Daejeon 305-600, Republic of Korea.

E-mail: youngmin@krict.re.kr; sjeong@krict.re.kr

[b] Department of Advanced Materials Engineering, Sungkyunkwan University, Suwon 440-746, Republic of Korea.

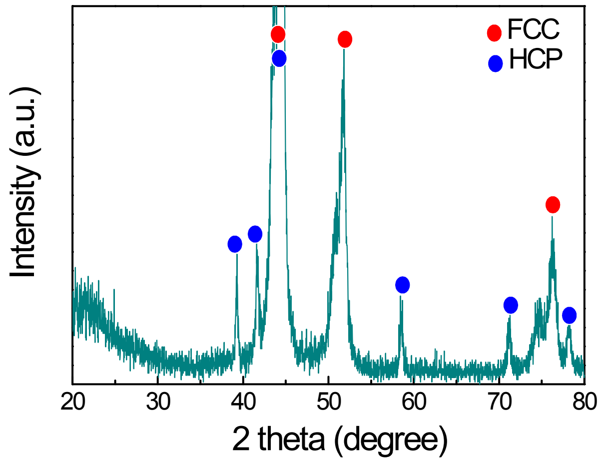

Figure S1. X-ray diffraction result for Ni nanoparticles synthesized without oleic acid (sample #1).

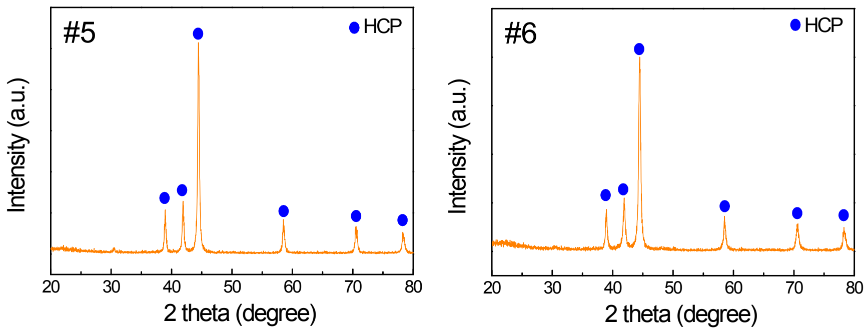

Figure S2. (a) X-ray diffraction results for Ni nanoparticles synthesized with different concentrations of phenylhydrazine, 5.5 M (sample #5), and 4.5 M (sample #6), without the presence of oleic acid.

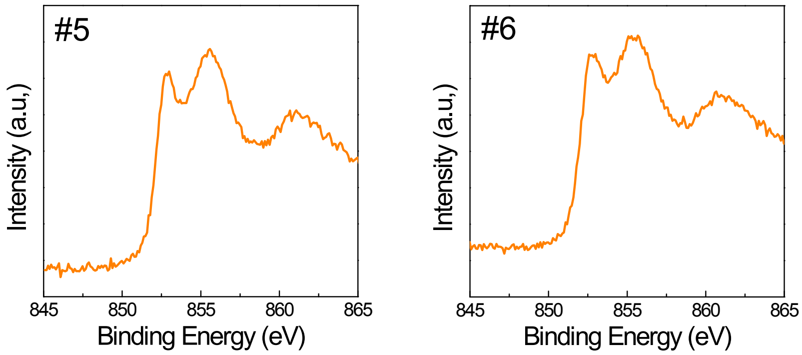

Figure S3. X-ray photoelectron spectroscopy spectra of Ni $2p_{3/2}$ for Ni nanoparticles synthesized with different concentrations of phenylhydrazine, 5.5 M (sample #5), and 4.5 M (sample #6), without the presence of oleic acid.

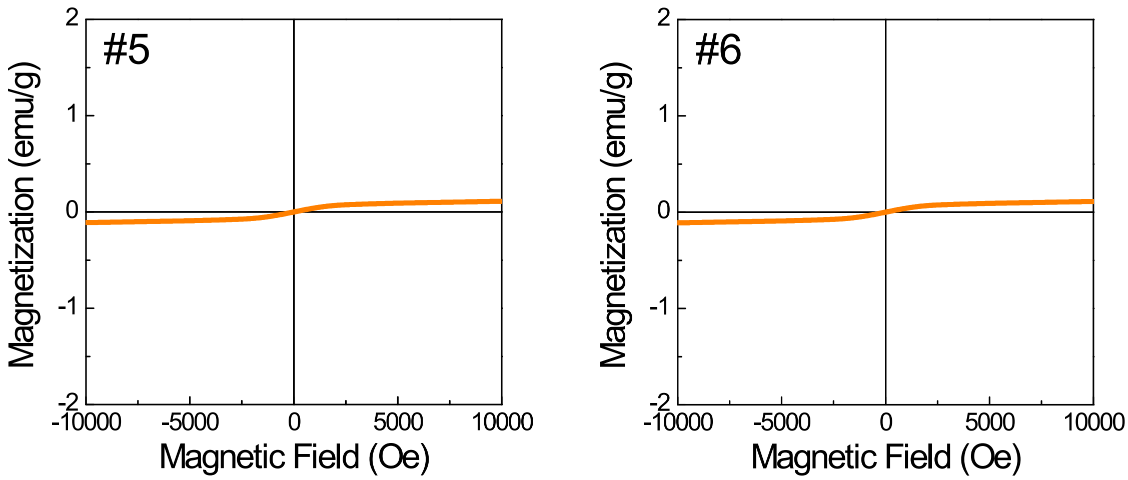

Figure S4. Field-dependent magnetization of Ni $2p_{3/2}$ for Ni nanoparticles synthesized with different concentrations of phenylhydrazine, 5.5 M (sample #5), and 4.5 M (sample #6), without the presence of oleic acid.

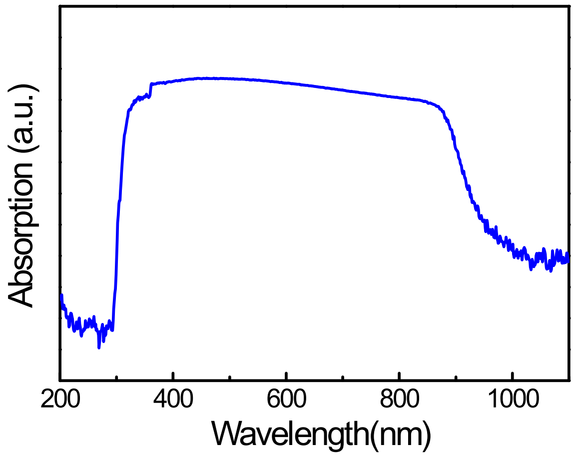

Figure S5. UV-visible spectroscopy for the Ni nanoparticle film printed on a glass substrate. The absorption background of the glass substrate was subtracted.

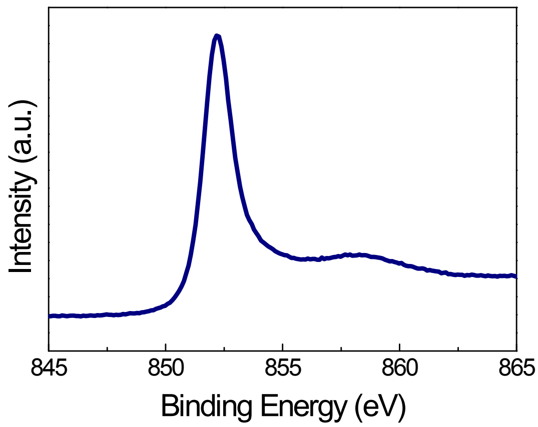

Figure S6. X-ray photoelectron spectroscopy spectra of Ni $2p_{3/2}$ for the Ni nanoparticle film photo-annealed at 2.0 kV for 1.5 msec.

a

Time (10^{-3} sec)

Voltage (kV)	0.5	1.0	1.5	2.0
2.0	0.39	0.86	1.34	1.77
2.3	0.53	1.14	1.75	2.29
2.5	0.62	1.31	2.00	2.64
3.0	0.86	1.78	2.71	3.44

(unit: J/cm²)

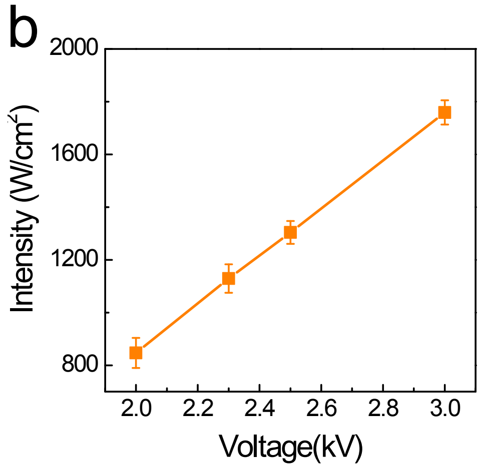

Figure S7. (a) The variation of photon energies as a function of voltage and duration time, (b) the variation of intensity depending on the applied voltage in the range of 2.0~3.0 kV.

Time (10^{-3} sec)

Voltage (kV)	0.5	1	1.5	2.0
2.0			540	433
2.5		333	309	322
3.0	468			

(unit: 10^{-6} Ωcm)

resistive

partially peel-off

completely peel-off

Figure S8. Resistivity evolution in Ni nanoparticle films, patterned on a PI substrate by air-brush printing of Ni nanoparticle suspension, depending on flash-type photonic annealing conditions (voltage and time).

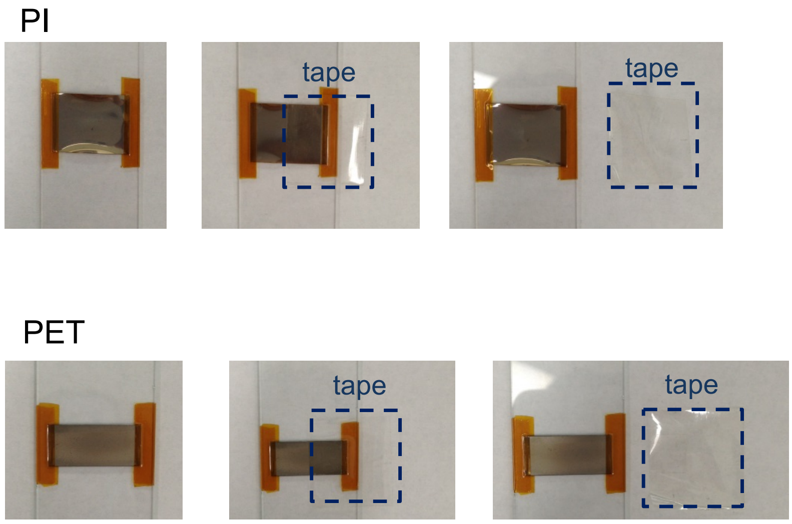

Figure S9. The adhesion tests for air brush-printed Ni films on either PI or PET substrate after photonic annealing process. The printed Ni nanoparticle layers were photo-annealed on PI and PET for at 2.5 kV 1.0 msec and at 2.0 kV for 1.5 msec, respectively.