Supplementary Information

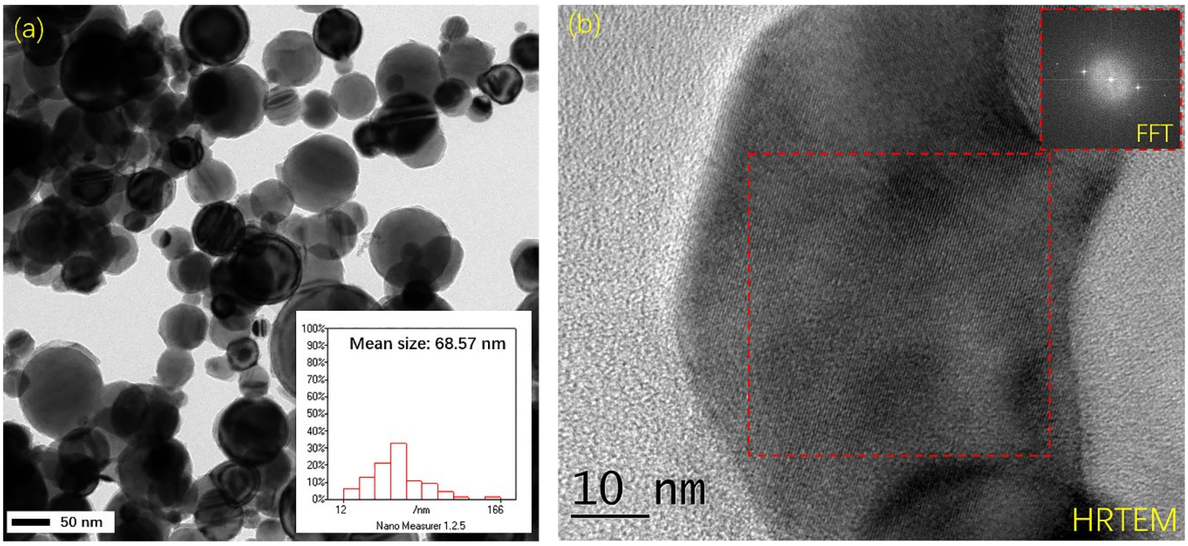

Fig. 1 (a) TEM image and grain size of the original 70 nm nickel; (b) High-resolution TEM of 70 nm nanoparticle. Inset: Fast Fourier Transform (FFT) patterns of Ni from 70 nm nanoparticle.

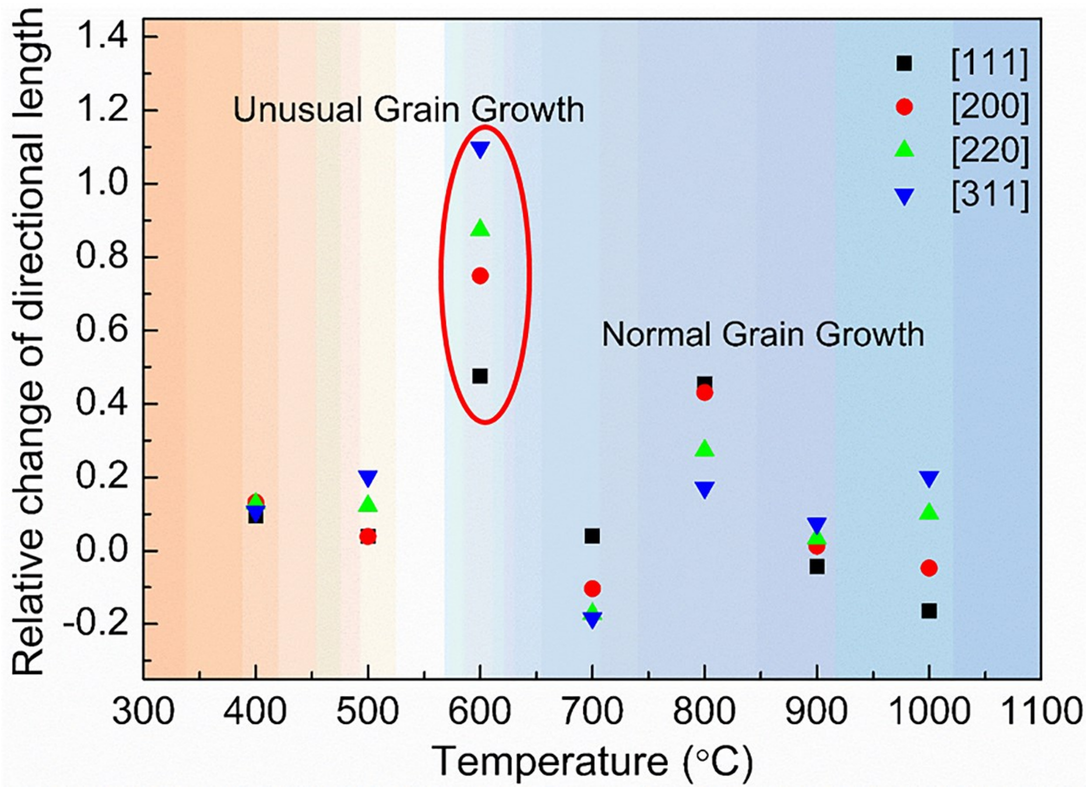

Fig. 2 The relative change of directional length along (111), (200), (220) and (311) with varying

calcination temperature. The directional changes were estimated using the fraction of crystal size increasing calculated with Scherrer equation from these planes, respectively. The reference of one data point was the data of the same plane from the sample calcined at 100 ºC lower than this point. For instance, the directional change of (111) at 500 ºC was $(D_{(111),\ 500\ ^\circ C} - D_{(111),\ 400\ ^\circ C})/D_{(111),\ 400\ ^\circ C}$. As shown in this figure, the directional length change along [311] is about 110 % and about 50 % along [111], which qualitatively indicates that the nano-sized Ni growth in calcination is anisotropic.

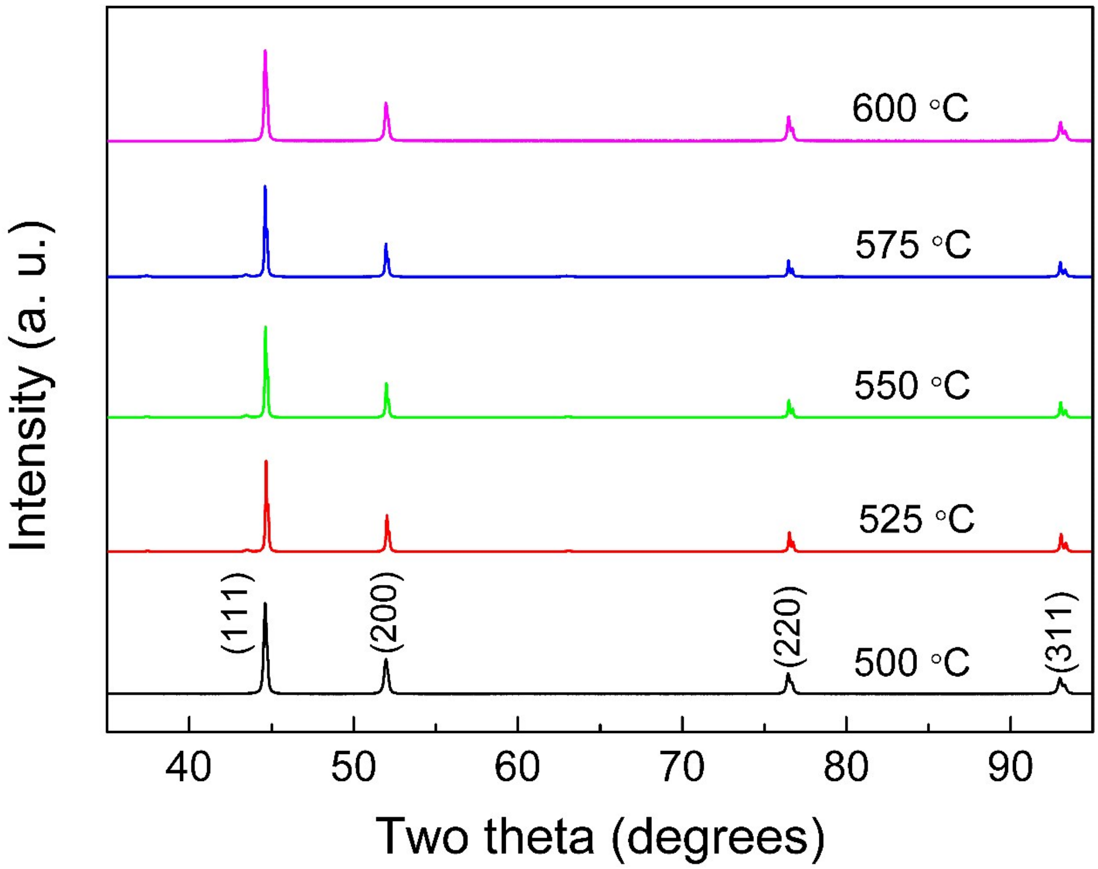

Fig.3 XRD results of the pre-pressed nickel nanoparticle disks recovered from five temperatures points (500 ºC, 525 ºC, 550 ºC, 575 ºC, 600 ºC). **(Point 2 by Reviewer #5)**

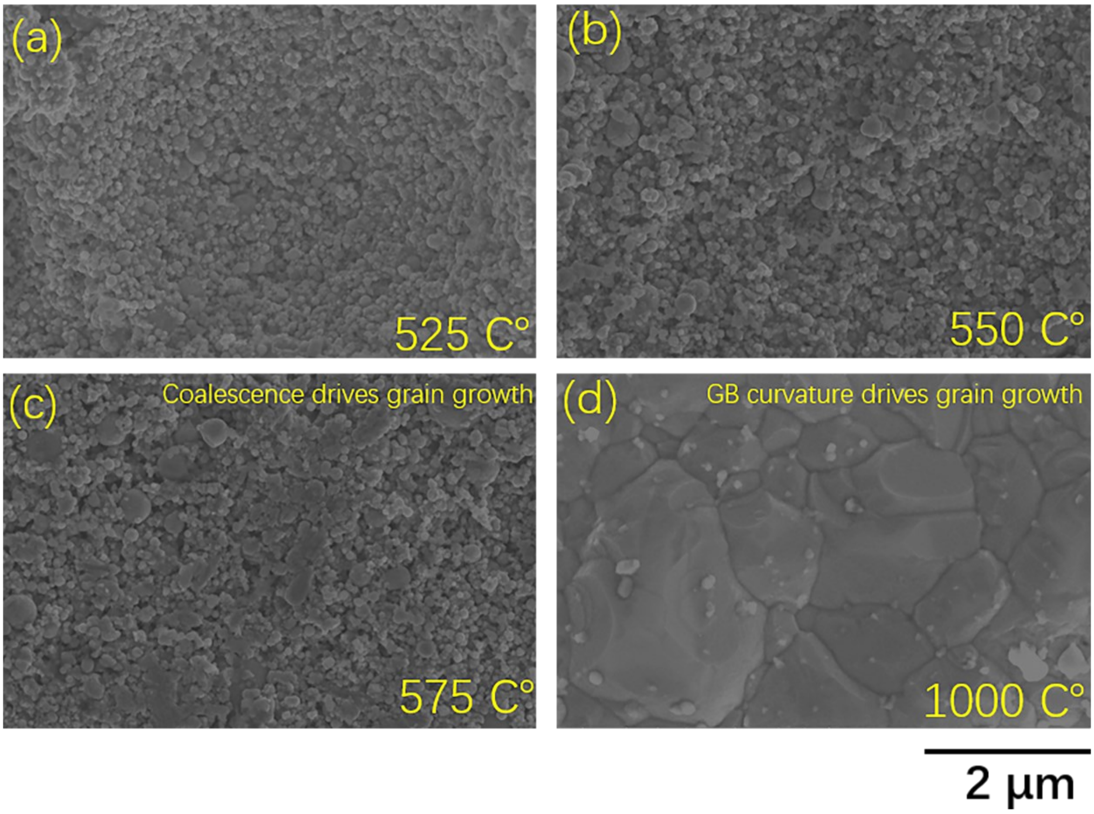

Fig. 4 SEM morphology of samples after calcined under different temperature. In the temperature range between 500 ºC to 600 ºC, grain start to coalesce into large clusters with increasing temperature, but in high temperature (1000 ºC), grain grows mainly by GB diffusion or immigration as the grains are too large to rotate for orientation attachment, resulting into normal grain growth.

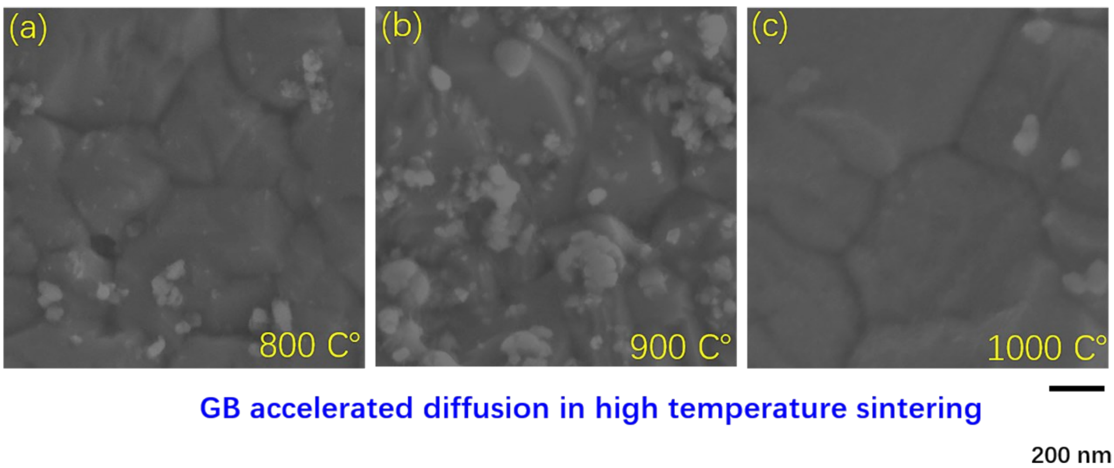

Fig. 5 SEM morphology of samples after calcined under high temperature (800 ºC, 900 ºC and 1000 ºC).