Supporting Information

Nickel nanoparticles immobilized on three-dimensional nitrogen-doped graphene as a superb catalyst for generation of hydrogen from hydrolysis of ammonia borane
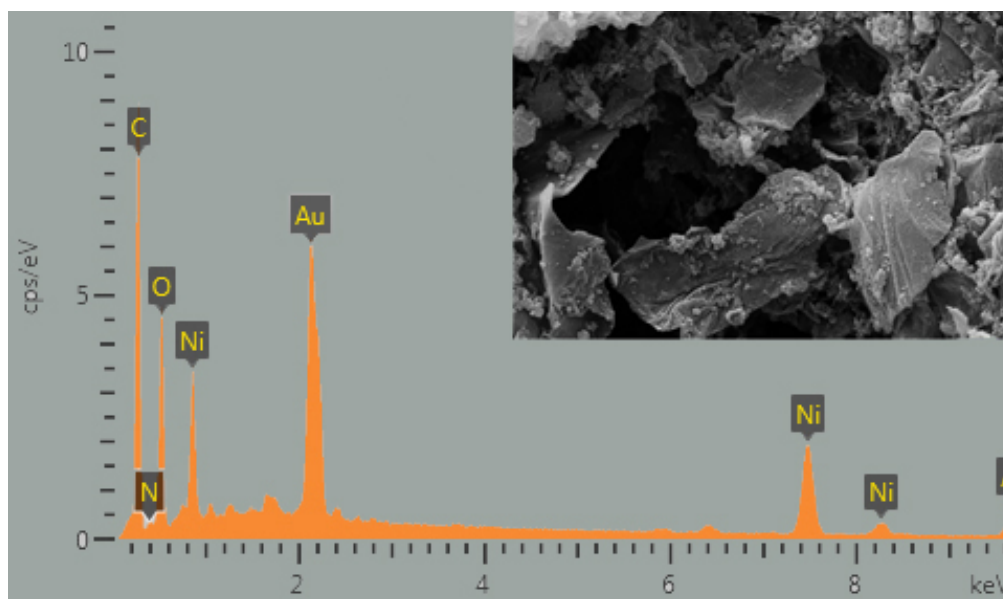
*Mojtaba Mahyari, Ahmad Shaabani**

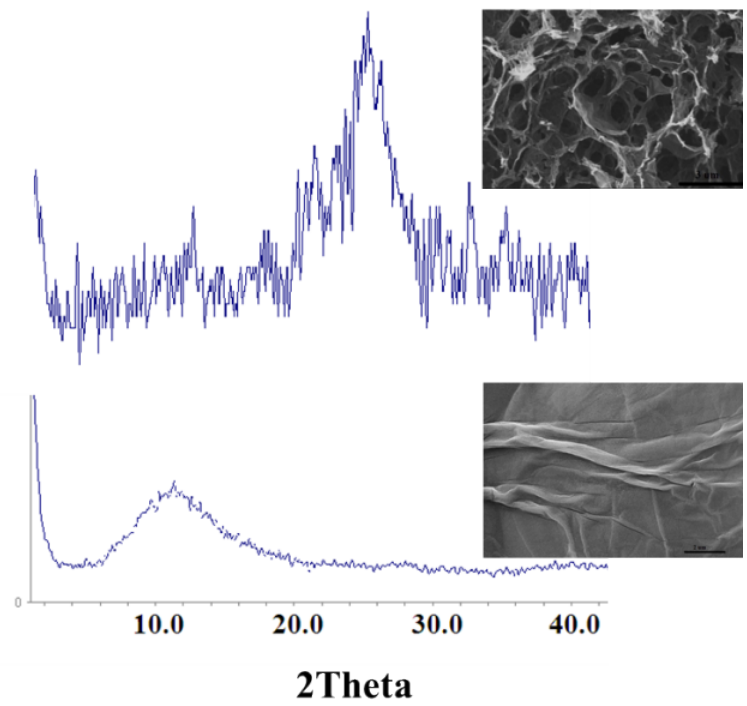**Figure S1.** X-ray energy dispersive spectrum (EDS) of NiNPs@3D-(N)GFs

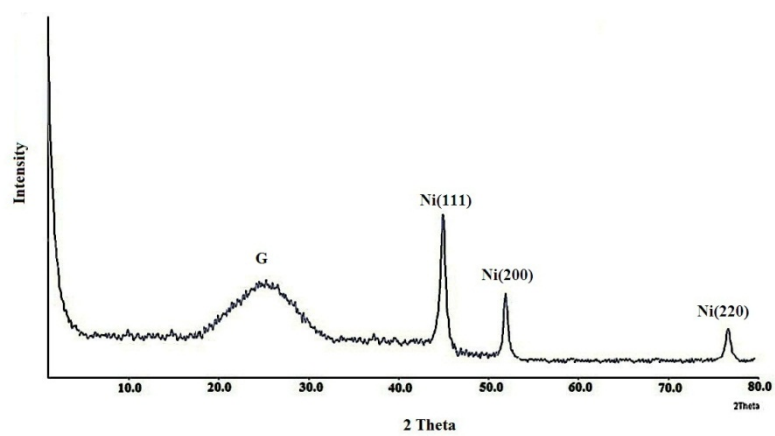**Figure S2.** XRD patterns of GO and 3D-(N)GFs.

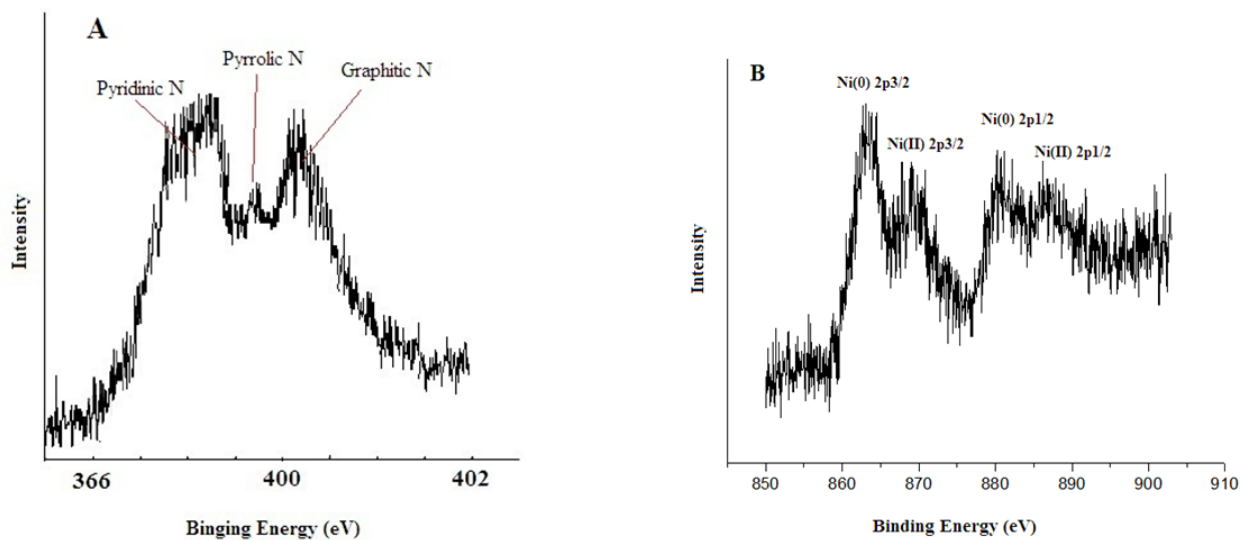**Figure S3.** The XRD pattern of NiNPs@3D-(N)GFs

Figure S4. Wide scan XPS spectra of the N 1s (A), Ni 2p (B), and B1s of NiNPs@3D-(N)GFs
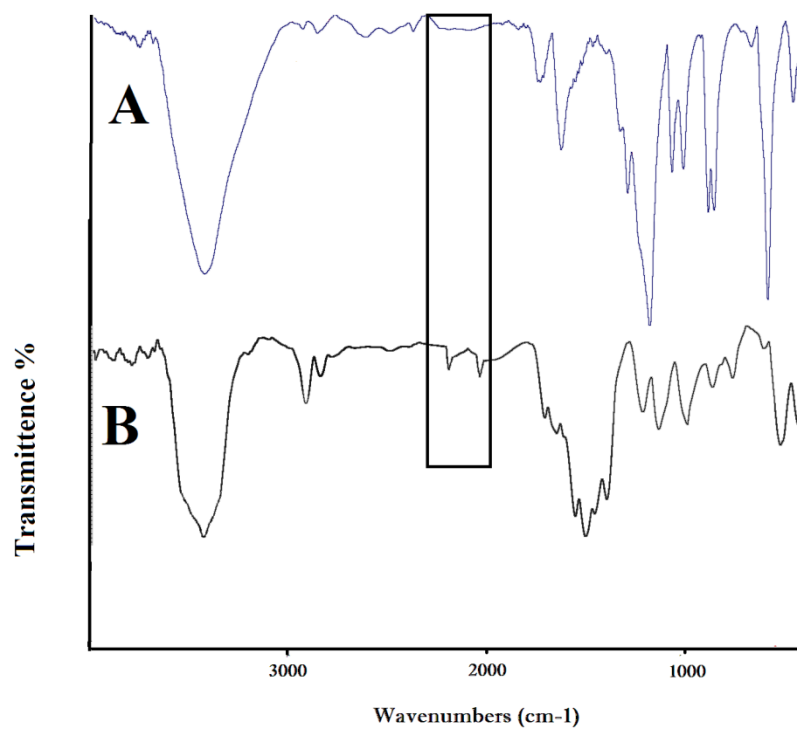

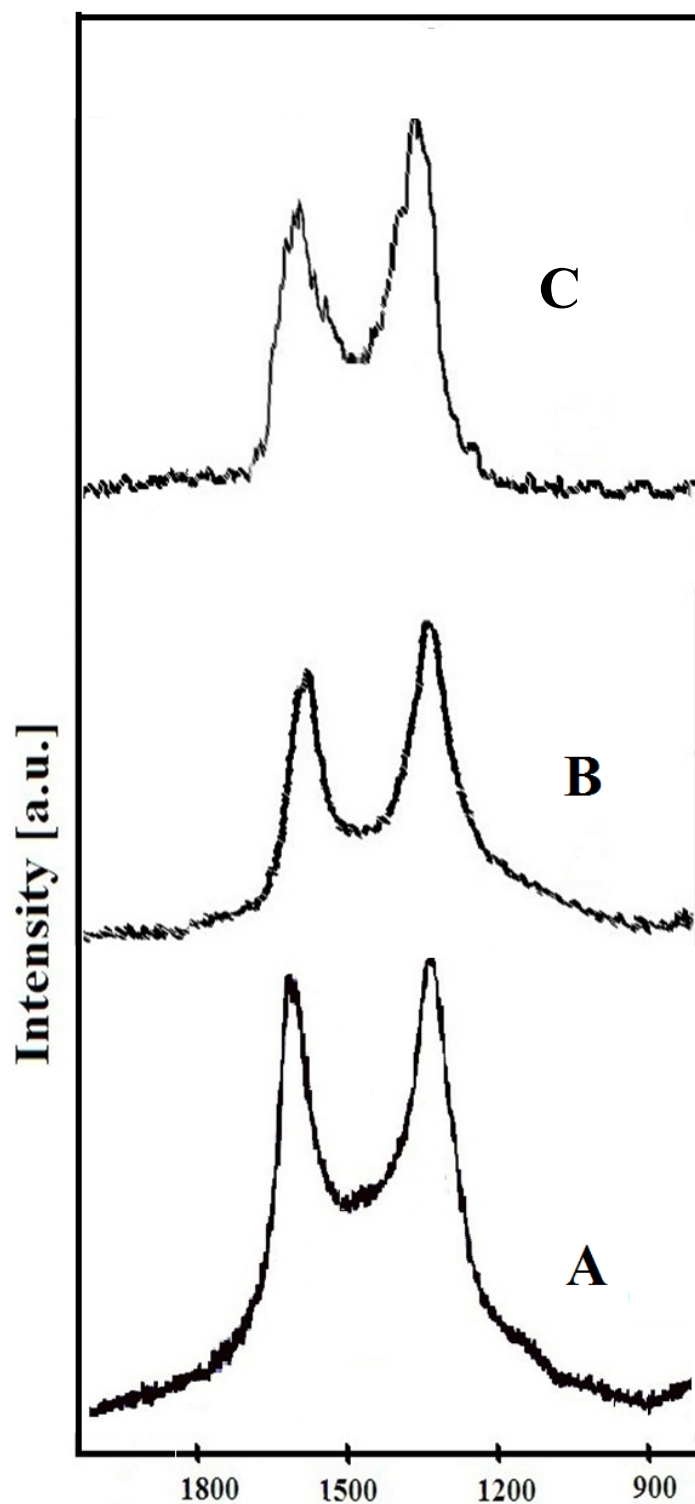**Figure S5.** FT-IR spectra for GO (A) and 3D-(N)GFs (B)

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Figure S6. Raman spectra of the GO (A), 3D-GFs (B), and 3D-(N)GFs (C)

- Calculating turnover frequency (TOF)

Turnover frequency (TOF) was calculated with dividing the mol of H_2 per time of the reaction and mol of Ni catalyst. The amount of AB and catalyst for each reaction were

63.5 mg (2.06 mmol) and 10 mg (0.0187mmol Ni, catalyst contained 11% wt Ni),

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respectively. On the other hand, 3 mmol H_2 was released per mol of AB. So, turn over number (TON) was calculated to be $3 \times 2.06/0.0187 = 333$. TOF was obtained by dividing TON per time, $333/8 = 41.7$.