Name of the report (the name should correspond to the name mentioned in abstracts)

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Searching for high performance, inexpensive and durable non-noble-metal electrocatalysts for hydrogen evolution reaction in an acidic environment is crucially important for next progress of a clean sustainable economy.

Hemp fiber derived carbon template was prepared using carbonization (800 °C) and chemical activation (KOH as a agent) stages (marked as AC materials). Additionally AC was treated with HNO_3 as nitrogen source at 70 °C under N_2 for N-containing surface functional groups forming and wettability increasing by an aqueous electrolyte (marked as ACN materials). Carbon templates were vacuum degassed (200°C, 12 h) and transferred at low pressure to quartz chamber with the vapor of sublimated nickelocene ($Ni(Cp)_2$). After $Ni(Cp)_2$ adsorption for its dissociation the obtained materials were irradiated with UV light (27 W, main wavelength of 365 nm) at continuous mixing for 5 days (marked as Ni:AC and Ni:ACN materials, respectively). The Ni loading of 4-5 wt % was obtained. The thermal treatment of both AC and ACN was carried out in argon stream at temperature range of 400-700°C for 1 hour. XRD patterns (XRD-7000, Shimadzu) of the AC and ACN templates demonstrate the broad (002) and (10*l*) peaks indicating the turbostratic ordering of carbons matrixes (Fig.1). There are no changes for XRD patterns of as-synthesized and annealed at T≤400°C Ni:AC and Ni:ACN sample. The clear presence of metal Ni phase was observed for Ni:AC-700 and Ni:ACN-600 materials. The nitrogen adsorption–desorption isotherms (Autosorb Nova 2200e, Quantachrome) of all Ni:AC and Ni:ACN samples are the mixture of II and IV types. The as-prepared and annealed samples possessed micropores (NLDFT model) with a narrow size of 1.35 nm (Fig.2). Ni particles presence causes the filling part of these micro-pores and BET surface area decreasing from 1200 to 1000 m^2/g. The annealing leads to the growth of Ni particles micropores-confined and causes its migration to the surface of carbon grains that is observed as a gradual restoration of initial pore size distribution and BET surface area.

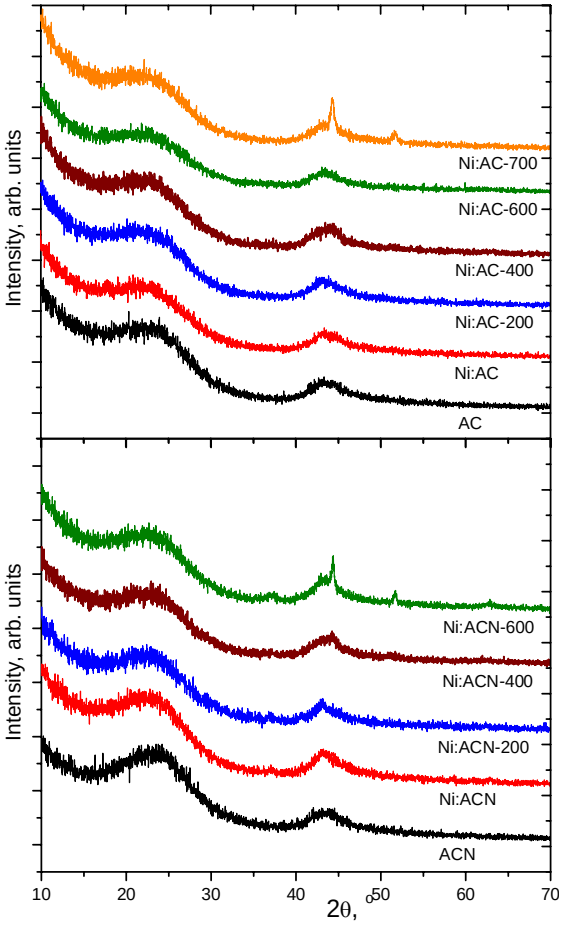

Fig.1

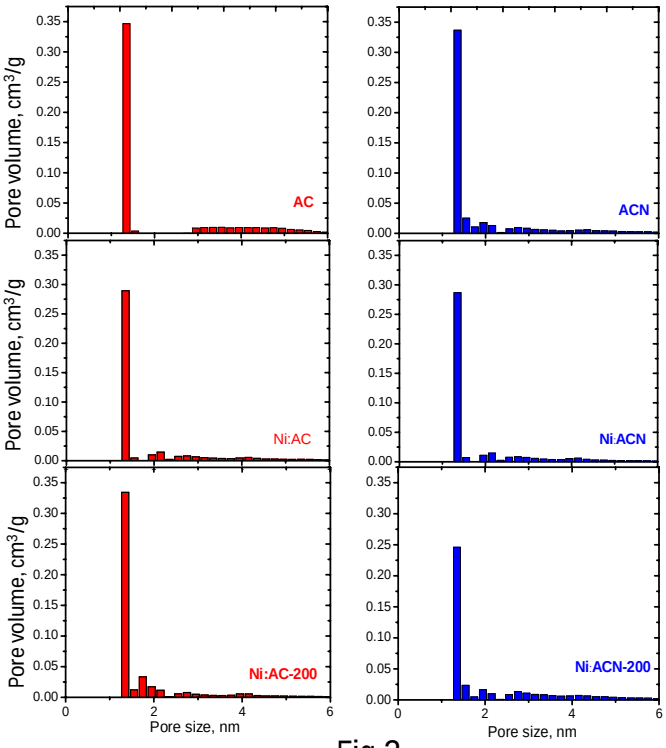

Fig.2