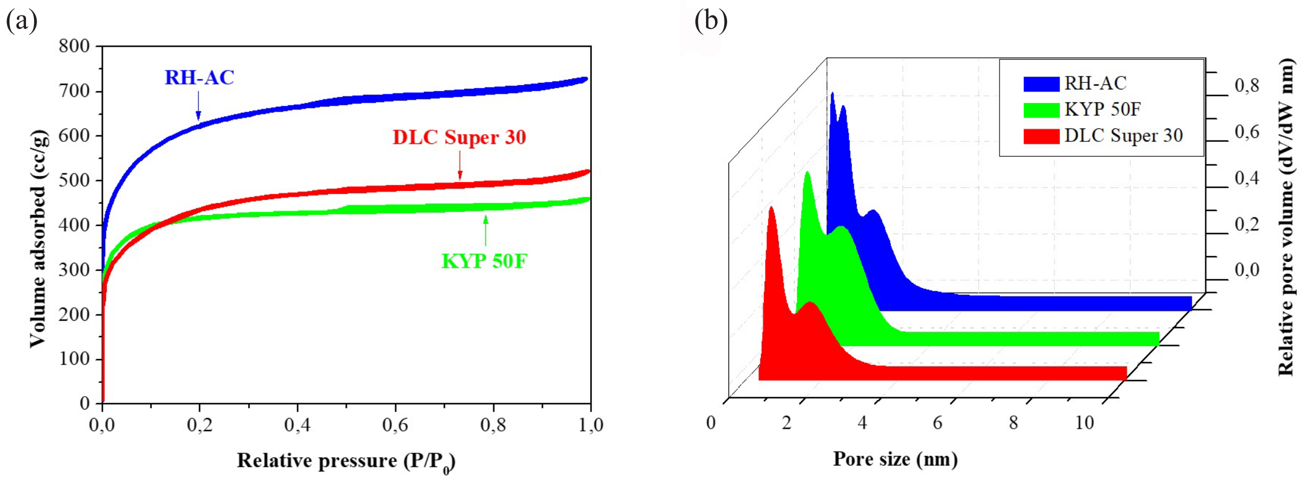

Fig. 3. Parameters of porous texture: (a) Nitrogen adsorption/desorption isotherms realized at -196 °C, (b) pore size distribution.

Table

Porosity parameters of various electrodes

Sample	BET surface area [m^2/g]	Cumulative surface area [m^2/g]	V_{micro} < 2[nm] [cm^3/g]	V_{meso} 2-50 [nm] [cm^3/g]	Average micropores size (L_0) [nm]	Average mesopores size (L_0) [nm]
RH-AC	2290	1990	0.80	0.18	0.88	4.12
KYP 50F	1560	1401	0.60	0.05	0.87	5.25
DLC SUPER 30	1598	1332	0.57	0.17	0.92	3.15

50F, DLC SUPER 30 which are equal to 1560 m^2/g and 1598 m^2/g, respectively. On other hand, the pore size distribution represented in Fig. 3b indicates that RH-AC has a big fraction of ultramicropores (<0.7 nm), which have a higher adsorption potential towards the small ions, i.e. Na^+, Cl^- dissolved in water.

From the obtained voltammograms illustrated in Fig. 4a, it was observed that all three types of electrode materials exhibit the nearly rectangular shape of cyclic voltammetry curves CVs, indicating a capacitive behavior that mainly arises from the charge and discharge of the EDL [20]. The highest capacitive current was observed for 2E cells based on RH-AC, while the lowest one for YP50F. It is indicated, that capacitive current is higher for the materials with the higher specific surface area. Thereby, one can see a correlation between this current and the textural parameters, e.g. specific surface area of the materials. However, it should be noted that the trapping of ions is also influenced by the relative relationship between the size of pores and ions. Moreover, in the case of galvanostatic charging/discharging all three tested materials display a typical triangular shape (Fig. 5b). The cells assembled with RH-AC exhibits the highest capacitance which is equal to 94 F g^{-1}, but meanwhile, it has the lowest coloumbic efficiency and charge propagation properties. In turn, the DLC Super 30 and KYP 50F display moderate capacitance equal to 85 F g^{-1} and 81 F g^{-1}, respectively. The 2E cell based on DLC Super 30 exhibits the highest coloumbic efficiency of 98%.

An experimental installation for CDI of water solutions illustrated in Fig. 5 was used to investigate the electrosorption performance of different electrode materials based on DLC Super 30, KYP 50F and RH-AC. The CDI experiments were realized in NaCl solution which had an initial conductivity of 574 μS cm^{-1}. Figure 6a shows the variation of solution conductivity versus time. It can be seen that all the curves display a similar shape, and reach an electrosorption saturation after charging for about 30 min. Additionally, the lowest conductivity of outlet solution equal to 495 μS cm^{-1} was obtained when the electrodes based on RH-AC were applied, whereas the similar values for KYP 50F and DLC Super 30 were equal to 511 μS cm^{-1} and 505 μS cm^{-1}, respectively.