

Figure S1 :  ${}^{13}$ C CP-MAS NMR spectra of the hybrid phases: a) coprecipitated Mg<sub>2</sub>Al-VBS and b) 3-DOM Mg<sub>2</sub>Al-VBS after thermal treatment at 453K.



Figure S2: a) N<sub>2</sub> adsorption-desorption isotherm and pore size distribution for C-carbon, obtained after carbonization and demineralization procedure on coprecipitated Mg<sub>2</sub>Al-VBSp.

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Figure S3: Variation of the voltammetric charge  $q^*$  with respect to the sweep rate v, expressed as  $q^{*-1}$  versus  $v^{1/2}$  for a) C-carbon and b) 3-DOM carbon.

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Figure S4: Variation of the voltammetric charge  $q^*$  with respect to the sweep rate v, expressed as  $q^*$  versus  $v^{-1/2}$  for a) C-carbon and b) 3-DOM carbon.