Unzipped carbon nanotubes via KOH activation

한조아[1,2], 김주연[1], 노광철[1,†]
[1]한국세라믹기술원; [2]고려대학교
(rkc@kicet.re.kr†)

We prepared unzipped CNTs with high specific surface area (1123 m^2 g^{-1}) and a trimodal (micro-meso-macro) pore structure through alkali activation. As per the non-localized density functional theory (NL-DFT), the distribution of micro-meso pores showed evidence of unzipping because the peak for pore sizes <1 nm, measured from the partially opened tips of the pristine CNTs, was broadened. Since the tips were perfectly opened after activation, this means that the micropores on the unzipped structure increased. In addition, the results showed that the unzipped porous CNTs had a trimodal pore structure. This structure resulted in increased specific surface area, as well as energy storage and adsorption capacities. The maximum energy density of the unzipped porous CNTs in ultracapacitors based on an organic electrolyte was 50 W h kg^{-1}. Thus, the method is suitable for fabrication of unzipped porous CNTs, which show potential as energy efficient materials.