Resorcinol formaldehyde xerogel derived carbon nanoparticles as anode material for lithium ion battery

Manohar Kakunuri, Sheetal Vennamalla, Chandra S. Sharma

Department of Chemical Engineering, Indian Institute of Technology Hyderabad, Yeddumailaram-502205, A.P., India

Resorcinol-formaldehyde (RF) based organic xerogel has been used as a precursor in the literature to prepare wide variety of carbon microparticles via polycondensation followed by inverse emulsification. To synthesize RF xerogel derived carbon nanoparticles, we allowed RF microparticles in the emulsion to settle down as sediments followed by dispersing them again in an organic solvent with continued stirring in the presence of non-ionic surfactant. Samples were then collected on stainless steel foil after 5 hours of stirring followed by drying in subcritical conditions for 12 hours. The samples were then pyrolyzed in the inert atmosphere at 900ºC to finally yield interconnected network of carbon xerogel nanoparticles as observed by scanning electron microscopy. Raman spectroscopy and X-ray diffraction studies reveal that RF xerogel derived carbon nanoparticles are hard carbon with smaller crystallites. Thus obtained carbon nanoparticles were then electrochemically tested for their potential applications as anode materials for lithium ion battery. Galvanostatic charge/discharge experiments performed at 0.1C rate suggest that lithium ion intercalation capacity for these carbon nanoparticles was considerably higher than that of graphite with columbic efficiency >95%.

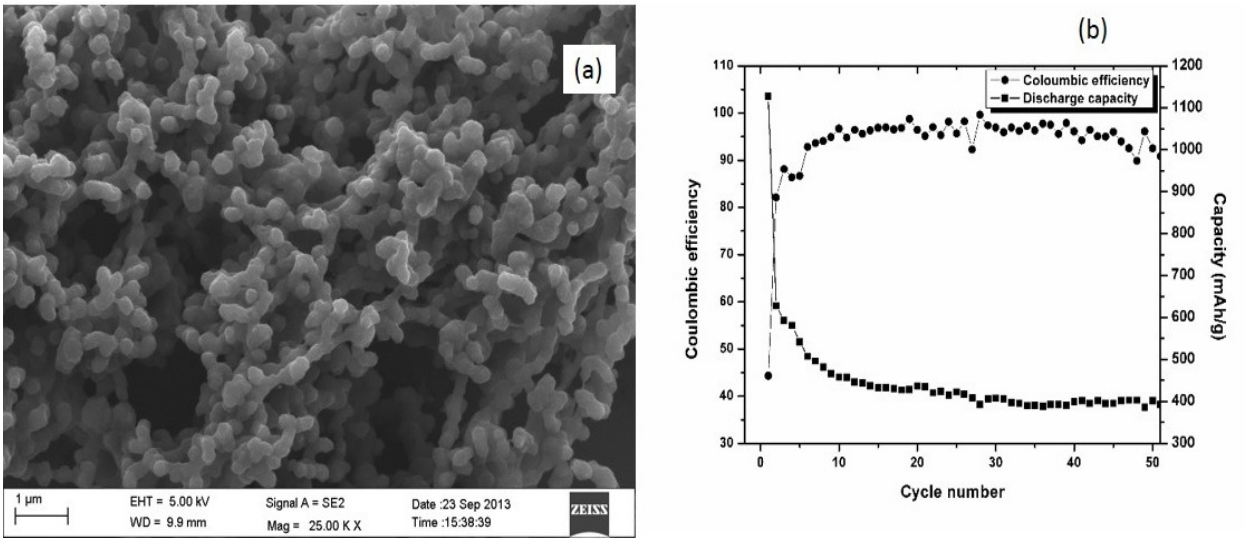


Figure 1: (a) FESEM image and (b) cyclic performance for RF xerogel derived carbon nanoparticles