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Application of Soot as a Composite Material For Li/S Battery Electrodes

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Preparation of carbon nanomaterials is an important field. We synthesize soot through the combustion of propane-butane mixture on surfaces. Hydrophobicity is characterized through the contact angle for water droplets placed on a surface covered with this soot. The influences of an electric field and metal catalysts are examined. Samples of soot obtained by burning propane-butane mixture with an imposed electric field of negative polarity show that the soot has a high dispersion and structural ordering, which enhances its hydrophobicity. The morphology structure of synthesized materials were investigated by scanning electron microscope.

Although sulfur is considered one of the promising candidate materials for the next generation lithium-ion batteries, lithium/sulfur (Li/S) batteries, because of its high theoretical gravimetric capacity, 1672 mAh/g and its extremely low cost, USD 150/ton ($LiCoO_2$ typically costs USD 40/kg), there are several challenging issues in order to realize Li/S batteries. Many efforts have been dedicated to impregnating sulfur, in Li/S batteries, into various carbon matrixes as mesoporous carbons, carbon fiber, carbon nanotubes, graphene.

In this work, we have been developed the simple method of synthesize sulfur/soot/polyacrylonitrile composite. Sulfur/soot/polyacrylonitrile composite was synthesized by heat treatment at 300 ^{0}C for 3 h in inert atmosphere. Integration of soot in the composite results highly conductive and highly conductive and mechanically flexible framework with enhanced electronic conductivity and ability to absorb the polysulfides into its structure. The cell with this S/SOOT/PAN composite cathode demonstrates a stable reversible specific discharge capacity of 800 mAh g^{-1} after 50 cycles at 0,1 C.