I. Development of Carbon Coating Layer for Chemical Flow Battery Electrodes

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Chemical Flow Batteries (CFBs) have technical advantages such as potentially separable liquid tanks and near unlimited longevity over most conventional rechargeable batteries. Recently, Lotte Chemical has developed a zinc-bromine (Zn-Br) flow battery where a thin coating of porous carbon is applied to prevent the polarization caused by the imbalance in reaction rates of Zn/Zn2+ couple and Br2/Br- couple. We propose an exploratory study on carbon coating which will provide a better understanding of the interplay between properties of coated carbon (pore characteristics and conductivity, and surface defects) and the cell performance. To this end, we will combine our recent advances on the pore size control in carbon nanofibers and inclusion of nanostructured carbon in nanofibers, which will offer an independent control of each carbon property,while keeping others the same. In the proposed research, carbon nanofibers will be prepared by gas-assisted electrospinning of carbon precursor/sacrificial polymer/conducting nanostructured carbon (carbon black powder, CNT, or graphene nanoribbon) solutions, followed by thermal treatments. We then utilize gas-assisted electrospinning, or electrospaying to effectively disperse the resulting carbon materials with controlled properties in a polymeric binder and to deposit them evenly on electrodes provided by Lotte Chemical. Electrodes with coating of various carbon materials with controlled properties will be evaluated in lab scales for screening, and eventually a few carbon coatings will be selected for field tests at Lotte Chemical.

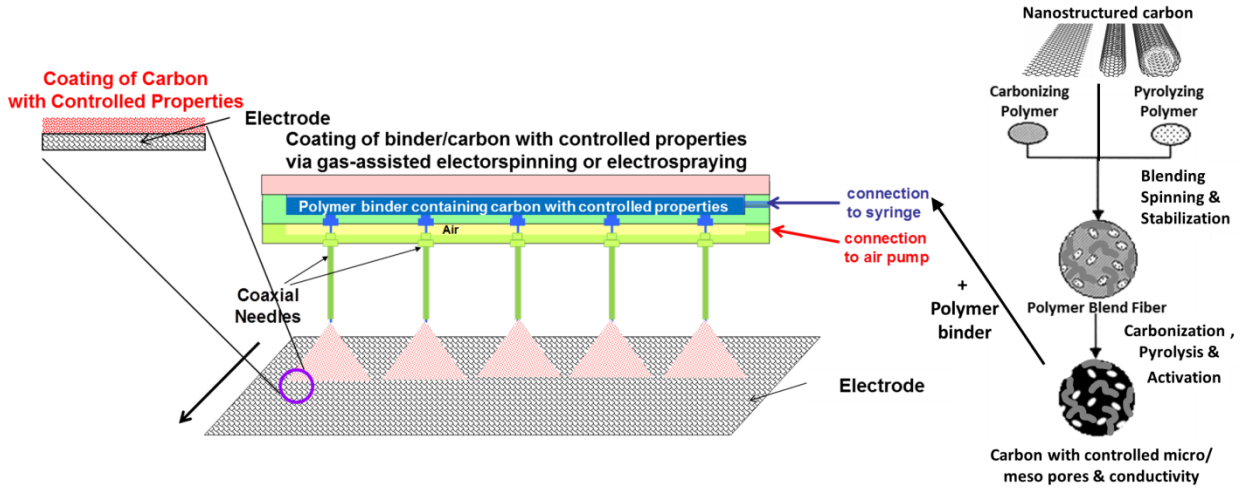

Fig. 1 *Schematic of facile coating of carbon with controlled properties via gas-assisted electrospinning of carbon/binder polymer solutions directly onto the electrode.*