CHAPTER V
CONCLUSIONS AND RECOMMENDATIONS

Electrodes of supercapacitor have been prepared using carbon xreogel, which were synthesized via ambient drying by using polybenzoxazine as a precursor. Carbon xerogel electrodes showed good electrochemical performances and the heat–treated carbon xerogel electrodes has higher capacitance than the electrodes without heat treatment due to its high useable surface area for electrical double layer formation.

Iron oxide/Carbon xerogel nanocomposites were successfully obtained by the impregnation method with a variation of iron oxide (Fe_3O_4) content and the supercapacitor performances were evaluated. The impregnation of iron oxide onto carbon xerogels has significantly improved the energy storage capability of these high surface area materials. The specific capacitance of hybrid composite electrodes was measured according to the galvanostatic charge/didcharge method. The electrode prepared by loading 3 wt% of Fe_3O_4 on heat–treated carbon xerogels exhibited the highest capacitance and excellent cyclability. This high specific capacitance was attributed to the pseudocapacitance effect from the surface faradaic redox reaction. However, the energy storage process of these new materials was limited by mass transport of electrolyte ions in the pores of the carbon xerogel if the content of Fe_3O_4 was further increased.

The effect of iron oxide is not only an essential issue for the high specific capacitance, but the variety of aqueous electrolytes is also the important issure. Therefore, we should study the influence of electrolytes in order to understand how the electrolyte composition, which results in the specific capacitance such as KOH, Na_2SO_3, Na_2SO_4, and Na_3PO_4. Furthermore, to enhance the higher specific capacitance of polybenzoxazine derived carbon xerogel electrodes, we should increase surface area of the electrodes since the pore structure of carbon xerogel can be controlled by the synthesis of polybenzoxazine.