# CHAPTER II

# PREVIOUS RESEARCH

In 1952, U.S. Pat. No. 2,609,347 by Christopher Lumley Wilson describes sponges made by reacting polyvinyl alcohol with formaldehyde. The sponge material described therein are made by a process comprising providing an aqueous solution of formaldehyde, polyvinyl alcohol containing less than 10% residual hydrolyzable material in the molecule, an acid catalyst in which the acid functional group is inorganic and having a dissociation constant of at least $10^{-2}$. The froth being formed prior to appreciable reaction between the polyvinyl alcohol and the formaldehyde; and stopping the reaction when approximately 35-80% of hydroxyl groups of the polyvinyl alcohol have been reacted with the formaldehyde. And, in 1953 Christopher Lumley Wilson discovered the sponge materials if a plasticizer is incorporated therewith. These plasticizers are polyethylene glycols and polyalkanolamines and may be introduced by soaking the sponge material in either the heated plasticizer or in an aqueous solution of plasticizer.

The sponges produced by the process described in above are undesirable for surgical sponges since they are not characterized by a pore geometry and size necessary for fast wicking and high liquid holding capacity.

In 1978, U.S. Pat. No. 4,098,728 by Solomon Rosenblatt investigated the preparation of PVA sponge adapted for medical usage, it would be desirable to provide a soft non-toxic uniformly expandable medical sponge having a high fluid holding capacity and fast wicking which is lint free, even when cut to a smaller size. The process are based upon discovery that by reacting polyvinyl alcohol and aqueous

formaldehyde solution in the present of acid catalyst under carefully controlled conditions, a medical sponge having controlled pore size uniformly distributed throughout its volume can be obtained that is expandable, biocompatible, lint free, soft, has fast wicking, and has a high liquid holding capacity is attained by controlling the temperature by which the formaldehyde and polyvinyl alcohol are mixed warm in the presence of a surfactant to entrain air and to form pores having a more fibrous thin walled cell geometry and a uniform size distribution.

Hermann Schindler and Wolfgange Zimmermann (1978), cited in [2], studied starch products which were hitherto used as pore-forming substances in the manufacture of polyvinyl alcohol sponges are replaced by polyethylene glycol or polyacrylamind. This results in a more uniform distribution of pore size, lower shinkage of the sponge material during the acetalization, and easier washing of the sponge after the acetalization.

In 1981, U.S. Pat. No. 4,296,210 by Wolfgange Zimmermann and Hermann Schindler studied the acetalization of polyvinyl alcohol in an acidic aqueous medium in the presence of a wetting agent yields an open-cell, solid foam when the reaction medium contains gas bubbles which are preferably produced by stirring air into the reaction mixture. By carrying out the acetalization in the presence of a nucleic acid a porous shaped article is obtained in which the cells are uniformly distributed.

In 1994, U.S. Pat. No. 5,284,468 by Thomas W. Nelson investigated the preparation of PVA sponge from a high molecular weight polyvinyl alcohol is used for forming a splint for a portion of body, such as during healing of a bone fracture or other injury. The sponge is maintained in a softened condition in the presence of vapors of a softening agent such as ethyl alcohol within a sealed pouch. Upon removal from

the pouch, the sponge is applied to the body portion and it hardens to form the splint as the softening agent vapors dissipate.

Accordingly, this thesis is interested in other point beyond of above review, which has not been attempted that is investigation of synthesis of Activated Carbon-filled sponge that is fit for air purifying. In this thesis, sponge material from above review can be modified to the activated carbon-filled sponge.