Recent development in the production of activated carbon electrodes from agricultural waste biomass for supercapacitors: A review Adekunle Moshood Abioye, Farid Nasir Ani

Activated carbon is the most widely used material in the making of electrodes for supercapacitors. I have already wrote about the characteristics that make activated carbon (AC) so useful (porous structure, high surface area, and chemical polarity). This paper discusses the different processes for making activated carbon. The authors focus mainly on the process of making AC out of biomass. Physical (thermal), chemical, physiochemical, and microwave-induced are the processes for activation discussed. Biomass activation is considered to be a much cheaper way of producing AC, as compared to using petroleum. It is seen as a way to mitigate the accumulation of biomass as well.

The process of physical activation consists of first heating the carbonaceous substance to a range between 400-850 deg C. Once the sample is heated and the surface has blackened, the carbon is activated with oxidizing gases like air, steam, or carbon dioxide that are heated between 600-900 deg C. The major function of this activating gas is to increase the porousness or the overall surface area of the original material.

Chemical activation most commonly utilizes potassium hydroxide and zinc hydroxide to pre-treat the carbonaceous material before activation occurs. Once the precursor material is treated, it is activated by heating to a range of 350-900 deg C. This heating process is again to make the structure as porous as possible. This process is more environmentally dangerous, time consuming, and expensive claims the author. This is because of the process of washing the AC of the initial activation chemicals. The final porousness has a high variability with chemical ratio and temperature.

Microwave assisted activation was proposed as a way to get around the issues posed by conventional heating. The temperature gradient caused by conventional heating leads to a porously inhomogeneous structure. Microwave heating transfers energy to the carbon by the oscillations of dipole rotations. This method offers low energy costs and fast activation times. These advantages have caused this method to become a popular method for carbon activation.

Biomass has proven to be a pretty effective material for making activated carbon, as the authors have indicated by citing porousness of other researchers. I will use these values in the final discussion.