Phosoythesis and water: why researches have created a divorce between them?

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Photosynthesis is a natural process involving membranes, proteins and water, excited by the sun light, where (e-, h+) charges are separated to accomplished its on physical/chemical reactions. These chemical reactions are: negatives charges interacting with CO_2 molecules to produce the biomass (sugar) and the positives charge interacting with H_2O, to produce O_2. Both, the light absorption and the biomass production processes occur within and liquid phase immersed in water and minerals medium. For the first mechanism, the absorption of light and charges separation, water is mostly considered divorced from the processes. In most of the books and models involving photosynthesis process, water is extracted from the medium. In others words, chemicals as proteins (Chl, Carotene, etc) are extracted from leaves and analysed separately, regarding its physical properties (e.g.: optical absorption and emission properties). In summary, the photosynthesis' charges separation processes without water can be an erroneous way to produce scientific information. This fait represents a premeditate divorce within the studied system. Unfortunately, the natural nanosized environment (water, membranes, different molecules) may be as important as the molecules (Chl, Carotene), present in the photosynthetic processes. Their bandgap engineering physical parameters are not known. Researches don't' pay attention to this detail that has changed the opto-electronic sciences, concerning organic materials and devices. Molecules or materials bandgap engineering deals with the forbidden band energy relative position between different materials.

To mimic the natural photosynthetic process we need to understand the physical mechanism underlying its first step on its natural medium: how to separate electrical charges that naturally attract immersed in water. For most of the scientific photosynthesis community, it is enough to have the absorption of a photon by the leaves' organic molecules and negative and positive charges are separated for free expend. Truly speaking, these (e-, h+) pairs are only 'just married' after a photon absorption; they need a further step to get 'divorced' or separated on space (1). The just married (e-, h+) pair is called exciton, whose energy is very high for organic materials (up to 500 meV). To break up this excitonic interaction we need to expend energy, and we need an electric field as the driving force. Otherwise Nature is violating physical laws since it's beginning. E.g., the net flow of electrons to the reaction centre is possible only if an electric field is present in the opposite direction of this flow. The same argument holds for the flow of electrons or protons across the thylakoids nanomembranes. As an example, the 50 mV voltage between the interior and exterior of thylakoids membranes (~ 6 nm thick) should give rise to a 80000 V/cm electric field. This is about the value of an electric field of a p-n organic or inorganic diode junction. This electric field should be taken into account for the nearby nanomembrane/liquid interface on leaves. Surprisingly, the system (organic membrane/water + light) is easily able to separate electrical charges (2).

This talk presents many of the drawbacks concerning the photosynthesis process and mechanisms, its medium, leading to non-scientific conclusions. A physical and appropriate issue is proposed to overcome the cited drawbacks. Natural parameters will be associated to the polymer membrane/water + light artificial system.

1-M. Sacilotti et al June 2012, WJNSE: http://www.scirp.org/journal/wjnse/ .
2- G. Pollack et al: http://www.youtube.com/watch?v=XVBEwn6iWOo & www.ebnerandsons.com