



Thermochemical Fluids in Greenhouse Farming

Water recovery from humidity of the air

Thermochemical solutions allow to uptake water from the air without additional mechanical cooling. Depending on the specific liquid desiccant (usually solutions of salt and water), air can be dehumidified to a level between 35% (MgCl_2) to 10% (LiCl_2) relative humidity. This means that air with humidity beyond these values can be captured for the purpose of water production.

If ambient air relative humidity is above these values, humidity can be captured within the solution, while also the released heat from the phase change energy can be stored. Water and heat can be captured e.g., from daytime to night-time. During night, the heat can be used to evaporate the water again back to the air (desiccant de-sorption process) and within a second process, the water can be captured within a condensation process.

As night-time temperatures are usually lower, the process can potentially be driven without mechanical cooling, but passively by the cool of ambient air. This process only works at specific climatic conditions of daytime and night-time temperature and air humidity. To extend toward a universal solution, the desiccant can be heated during daytime by a solar thermal collector and can be further cooled (after the de-sorption process) during night-time within the same collector, working as a sky radiator then.

A further variation relates to a process, in which the desiccant absorbs water during night-time, using the higher relative humidity during this period. Directly after the absorption, the solution is heated well above the ambient temperature by solar heat stored from daytime to night-time, allowing to evaporate the water in a parallel process, again using the condensation driven by low night-time temperatures.



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