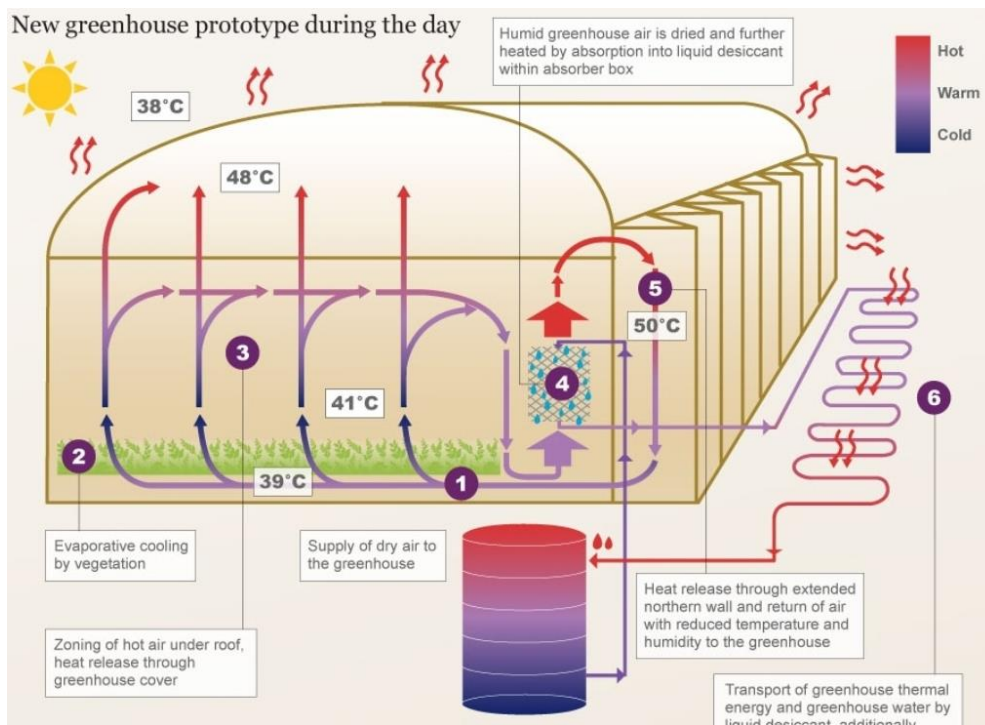




Thermochemical Fluids in Greenhouse Farming

Greenhouse farming in hot and dry climate regions using closed environments

A closed greenhouse qualifies for plant production at elevated CO₂ levels with the advantage of enhanced photosynthesis and increased production rates. In a normal greenhouse, cooling is mainly provided by the evaporative cooling of the plants and withdrawal of humid/hot air combined with supply of dryer and colder ambient air. In a closed greenhouse, cooling works totally different. An increased greenhouse surface allows to withdraw heat by conduction from hot greenhouse air through the surface to the colder ambient air without air exchange between inside and outside. A large portion of heat needs to be stored from daytime to night time, to compensate the lower cooling capacity of the heat conduction process and to use the heat conduction from inside to outside within all 24 hours of a day.



Thermochemical solutions allow to uptake a huge amount of heat during the hot period of the day by using the phase change between water vapor and water. Evaporative cooling of the plants is combined with the absorption process, which allows air de-humidification in the greenhouse atmosphere and heat transport from the air to a solution

storage. Heat and water from the air is captured and is released back to the greenhouse volume during night time. In this second period, greenhouse air is heated.

The hot air remains at moderate relative humidity and is distributed between the vegetation, hindering condensation in this area, while the cold greenhouse surface forces condensation and allows water recovery. Condensation droplets can be captured by a specific design of the roof area. Up to 85% of the irrigation water can be recycled. The desiccant is re-generated and cooled in this process which qualifies for the next daytime period.



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