Thermochemical Fluids in Greenhouse Farming

Dessicant characterisations

Thermochemical fluids (TCF) are solutions with high hygroscopicity and reduce the air humidity. Different TCF can be selected for the control of humidity in greenhouses.

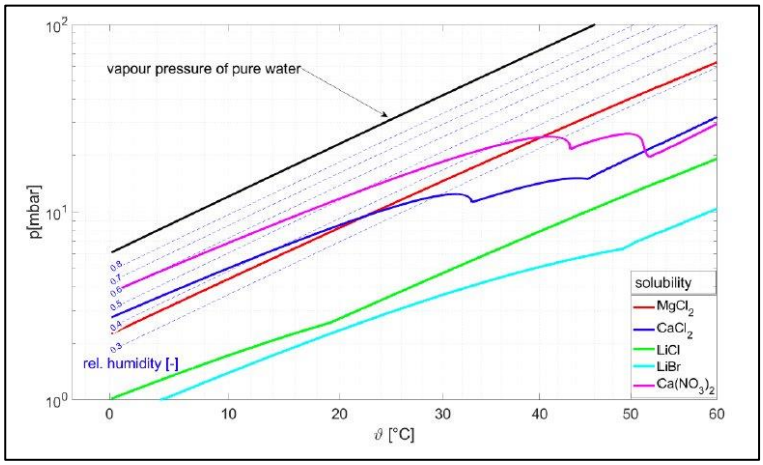
The main aspects to be considered are:

- Technological feasibility: Are the required hygroscopic properties available for the reduction of the humidity?
- Toxicity: Lethal dose of the TCF serves as indictor for this aspect.
- Cost: TCFs are required in relatively high amount. Costs of TCF are an indicator for the selection.
- Lifecycle impact (LCI): the environmental impact from the production and the transportation of the TCF to the final users.
- Crystallisation point: Is the crystallisation point below the lowest ambient temperature avoid thermal isolation of the system?

The main candidates are:

- $MgCl_2$ is from low LCI, toxicity and costs very interesting. The limited hygroscopic potential (at 20°C the minimum reachable air humidity is around 30%) is not a limit for application in greenhouse but is not suitable is drying processes.
- $CaCl_2$ is a candidate with similar properties of $MgCl_2$. However, the LCI is higher due to a more complicated production process.
- NaOH is high available, the cost is interesting but in open system the Na reacts with CO_2 in the air forming sodium carbonate which can damage and block the pipes and component.

Further state of art TCF are not considered for agricultural applications due to high costs and/or toxicity.



- LiBr and LiCl are substances used in closed systems with very good hygroscopic properties. However, the price of the material is very high, and the availability of Li could be problematic in the future.
- $Ca(NO_3)_2$ is a material of bit higher cost as $MgCl_2$, but with a higher crystallisation temperature.

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