
# Cocrystallization as a tool to solve deliquescence issues: the case of L-lactic acid

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## Title

Cocrystallization as a tool to solve deliquescence issues: the case of L-lactic acid.

## Abstract

L-lactic acid is an organic acid used in various fields such as food, cosmetic or pharmaceutical industry. Furthermore it is the building-block of poly-lactic acid, a biodegradable and bioavailable polymer. Still, handling L-lactic acid under its solid form remains less straightforward mainly due to its deliquescent behavior, a phase transition from the solid to the dissolved state resulting from air humidity absorption. If several techniques are already known to avoid or reduce deliquescence, the use of cocrystallization in this context is still poorly investigated. In this paper, we investigate whether cocrystallization can be used as a suitable solution for deliquescence in the case of L-lactic acid.

Out of 32 possible coformers tested, four were found to form cocrystals with L-lactic acid and the crystal structures of 1:1 L-lactic acid:D-tryptophan and 1:1 L-lactic acid:3-nitrobenzamide were determined. The hygroscopic behavior of these latter two was studied and compared to the behavior of pure L-lactic acid. Significant improvement was observed: dynamic vapor sorption at 25°C revealed that water absorbed at 90% relative humidity dropped from 1.3157 $g/g_{sample}$ to 0.0017 $g/g_{sample}$ or 0.0299 $g/g_{sample}$, with cocrystals of D-tryptophan and 3-nitrobenzamide respectively. This illustrates the effectiveness of cocrystallization as a tool to treat deliquescent materials.

## Keywords

Deliquescence; L-lactic acid; Cocrystallization; Crystal engineering; Relative humidity

## Highlights

- Identification of 4 cocrystals involving L-lactic acid
- Resolution of L-lactic acid:D-tryptophan and L-lactic acid:3-nitrobenzamide crystal structures
- Proof of the efficiency of cocrystallization to solve deliquescence-related issues

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