Estimation of particle size and shape using combined chord length distribution and imaging data

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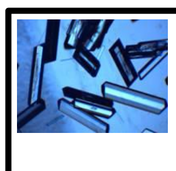
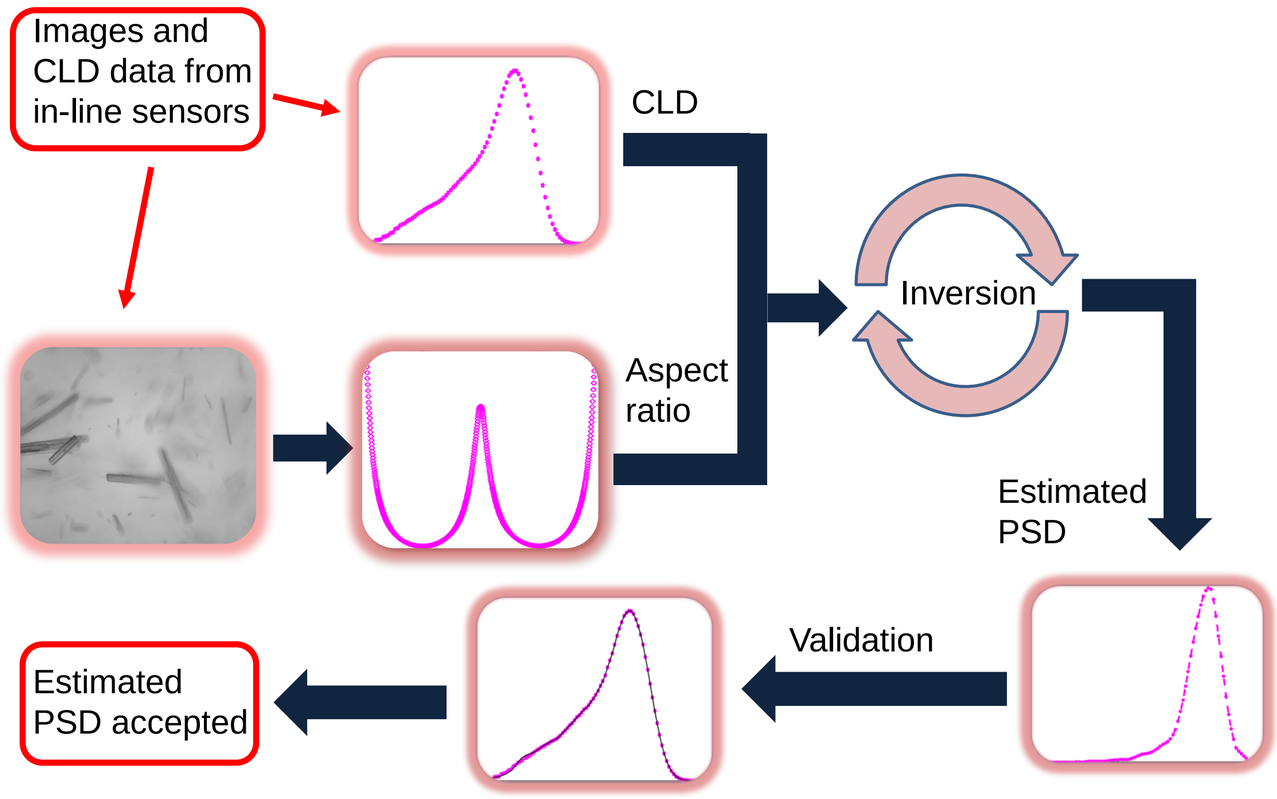
Introduction



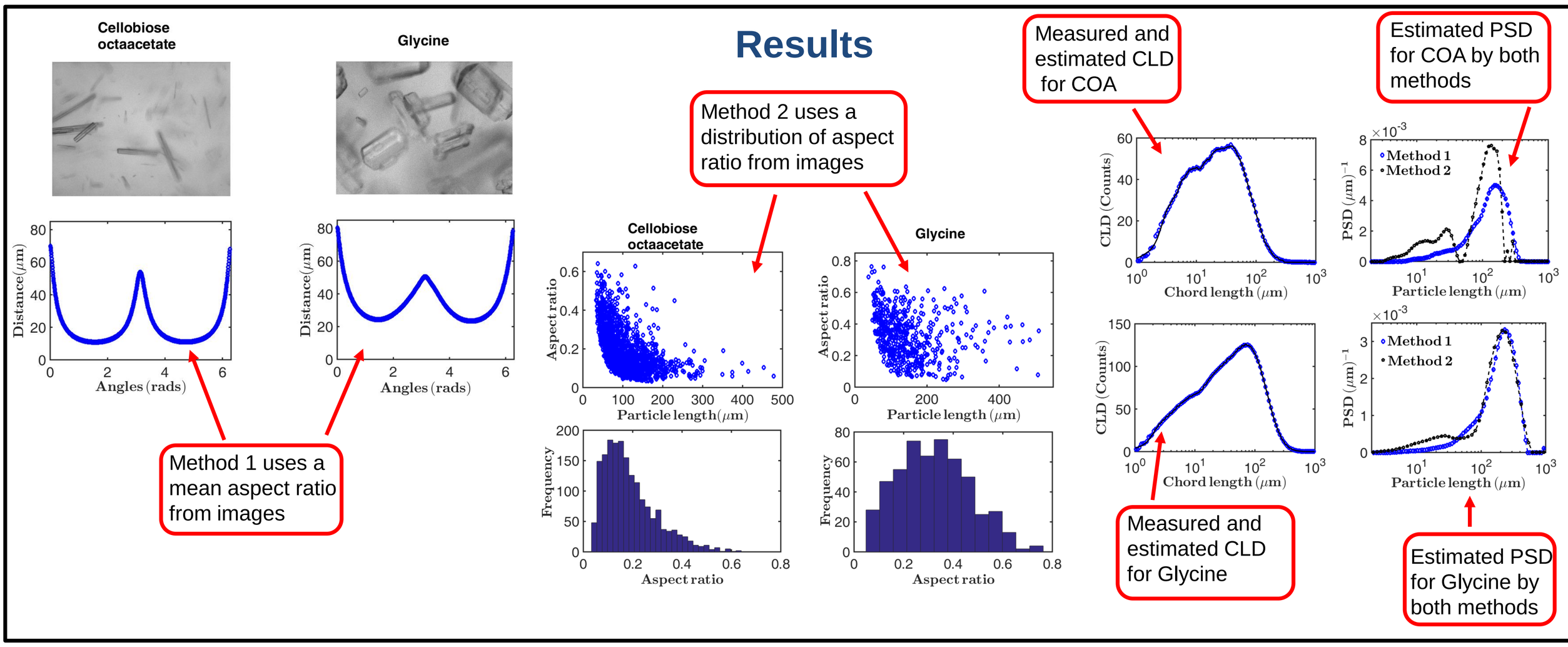
Crystallisation is the crucial step in the manufacture of particle products which determines the success or otherwise of the process. This is because the crystals produced during crystallisation need to possess some desired attributes (size and shape in particular) for the manufacturing process to succeed. For the crystals (or particles) produced to possess the desired attributes, it is necessary that the crystallisation process be controlled, and this requires the development of robust numerical algorithms for estimating the particle size distribution (PSD) and shape (quantified by an aspect ratio) in situ.

We have recently developed numerical algorithms [1, 2] for estimating the PSD and aspect ratio in situ suitable for application in crystallisation processes. The algorithms use data from in-line sensors which produce a chord length distribution (CLD) data as well as capture images of the particles [2]. The aspect ratio estimated from the images is used to constrain the inverse problem of estimating the PSD from the CLD (which contains information about the size and shape of the particles). The estimated particle sizes and shape obtained from our algorithms are consistent with the estimated sizes and shape from images [1, 2].

Modelling



Results



Summary

The need for control of crystallisation processes has lead to the development of robust algorithms for estimating the distribution of crystal sizes and getting shape information of the crystals in situ. The outputs from the algorithms agree very well with experimental data.

References

[1] O. S. Agimelen et al. Estimation of Particle Size Distribution and Aspect Ratio of Non-Spherical Particles From Chord Length Distribution. ***Chem. Eng. Sci., 123, pp. 629–640, 2015***

[2] O. S. Agimelen et al. Integration of in situ Imaging and Chord Length Distribution for Estimation of Particle Size and Shape. ***Chem. Eng. Sci. 144, pp. 87–100, 2016****.*

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