ALMAC

Partnering to Advance Human Health

Brochure

# Think Almac...
# Solid form screening


Understanding the physical properties of an active pharmaceutical ingredient (API) is essential to obtaining a developable solid form. By finding and understanding the most suitable form; API stability, solubility, bioavailability, and processability may be improved.

As a world leader in pharmaceutical services, Almac delivers unrivalled polymorph, salt, co-crystal, and early crystallisation work programs designed to identify the most developable solid form of your API to help accelerate development to the clinic and minimise risk in any downstream activities.

## Work programmes

Almac offer bespoke work packages specifically tailored to material availability or development phase, allowing a wealth of crucial data to be delivered with no detriment to scientific integrity or timelines, plus strengthening IP.

- Polymorph screens
- Salt screens
- Co-crystal screens
- Crystallisation and 'difficult to crystallise' screens
- Chiral resolution (enantiomeric) screens
- Hydrate mapping
- Single crystal growth for structural elucidation studies
- Powder X-ray diffraction (PXRD) method development
- Broad scope intellectual property (IP) screens
- Amorphous solid dispersions
- Comprehensive physical and chemical analysis


## Solid state characterisation & chemical identification

- Powder X-ray diffraction (PXRD) with indexing
- Structure elucidation from powders
- Polarised light microscopy (PLM)
- Thermal analysis (TG-DSC, DSC, hyper DSC, and hot-stage microscopy)
- Scanning electron microscopy (SEM)
- Single crystal X-ray diffraction (SC-XRD)
- Solution and solid-state nuclear magnetic resonance spectroscopy (NMR)
- Fourier transform infrared spectroscopy (FT-IR)
- Raman spectroscopy and Terahertz Raman Spectroscopy
- Comprehensive internal analytical chromatographic services (HPLC, UPLC, IC, GC)
- Water content by Karl Fischer titration

## Developability assessments

- Gram-scale repreparation and small-scale optimisation
- Hygroscopicity by dynamic vapour sorption / gravitational vapour sorption
- Indicative stability testing using ICH conditions
- Thermodynamic solubility profiling and biorelevant media dissolution testing
- Small scale intrinsic dissolution testing

## Salt screening

With careful consideration of the API pKa, dose, and mode of administration, risk to downstream development and counterion toxicity, salt screening at Almac is proven to identify pharmaceutically acceptable and developable salts of ionisable APIs to improve a wide variety of physical properties, including:

- Crystallinity
- Stability
- Solubility and bioavailability

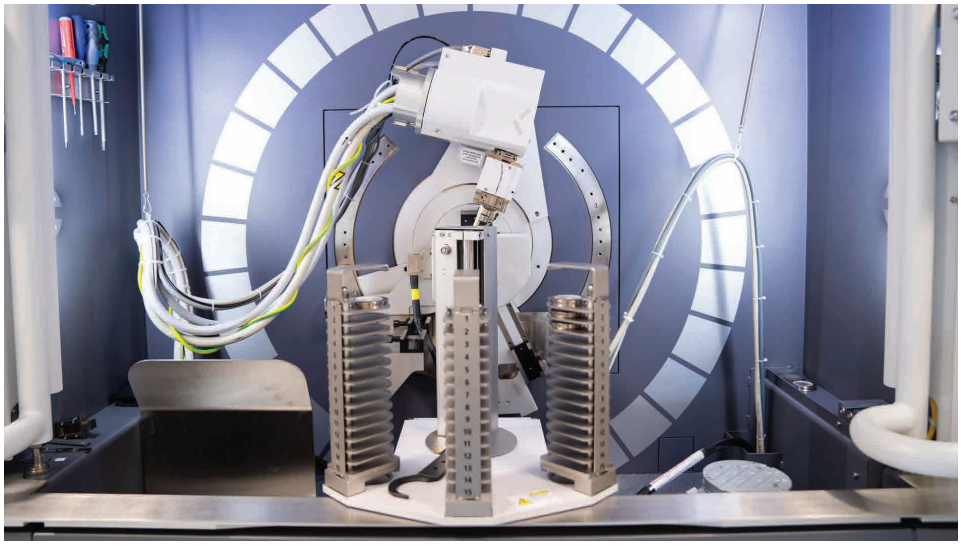
## Co-crystal screening

Co-crystallisation of an API with a co-former is an advanced technology designed to provide a new solid form with the following benefits:

- A unique route towards IP protection
- Increase API solubility and formulation stability

Using the following information, we maximise the chances of delivering a suitable co-crystal:

- GRAS / toxicity of co-formers
- Modelling of key molecular synthons
- Scalability of the co-crystallisation procedure
- Risk of disproportionation



## Polymorph & crystallisation screening

Polymorph/crystallisation screening may be invoked at any point during drug development. Depending on the phase of development and quantity of API available, studies incorporate the below experiments:

**Solution experiments:**

- Evaporation (slow and fast)
- Cooling (slow and fast)
- Anti-solvent precipitations
- Liquid and vapour diffusion
- Capillary crystallisations
- Polymer templated crystallisations
- Temperature cycling
- Ultrasonic nucleation
- Slurry at high and low T
- pH gradient (if ionisable)

**Solid-state experiments:**

- Grinding/milling (wet and dry)
- Melt quench
- Freeze drying
- Sublimation
- Compression
- Thermal, vapour and humidity stressing of amorphous and/or crystalline material
- Desolvation of hydrates & solvates

In collaboration with in-house crystallisation and chemistry teams, the most stable form may then be accelerated to the clinic with maximum efficiency via development of a robust, scaleable and transferrable crystallisation procedure.

Speak with the experts at Almac to find out how they are equipped with expertise and tools to locate and understand the most developable solid form of your API.

# Meet our experts

## **Tom Moody** - Vice President of Technology Development & Commercialisation

Prof. Tom Moody graduated from The Queen's University of Belfast with a 1st Class BSc(Hons) in chemistry in June 1998 before returning to gain a Ph.D. in Physical Organic chemistry in December 2001. He has also completed a Masters Degree in Business graduating with distinction in July 2007 specialiszing in business strategy. His work has earned him numerous accolades and is co-author and author of >50 publications and patents. Thomas is currently VP Technology Development and Commercialisation for Arran and Almac in Ireland and works in the area of Chemistry & Biocatalysis and its application towards the synthesis of chiral molecules, metabolites and labelled compounds. Thomas is responsible for managing a multi-disciplinary team of both chemists and biologists to obtain commercially useful biocatalysts and their intended applications. Biocatalytic processes have been developed from mg to tonne manufacture including development of fermentation processes to yield the desired biocatalyst. He has been a scientific leader and problem solver in >50 commercial projects in the past 3 years and acts as a consultant in the area of biocatalyst development for pharmaceutical and biotech companies. He is also an honorary Professor at Queen's University of Belfast in the area of biocatalysis.

## **Dr Jonathan Loughrey** - Physical Sciences Manager

Jonathan graduated from the University of York with a degree in Chemistry and joined Abbott Laboratories as a process chemist, studying controlled crystallization and quantitative identification of high risk polymorphs within final batches of drug substance. Jonathan then completed a PhD in organic chemistry at the University of Leeds and after various postdoctoral appointments in the UK and USA, Jonathan joined a boutique UK contract research organization specializing in solid form development of active pharmaceutical ingredients, rising through the ranks to eventually oversee their global materials characterization and solid form screening business function. In June 2021, Jonathan joined Almac to oversee Almac Science's Physical Sciences business function which incorporates all aspects of materials characterization, solid form screening (polymorphs, salts, and co-crystals), crystallization process development, amorphous solid preparation, milling and micronisation, and preformulation/tox formulation development for small molecules and peptides.

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