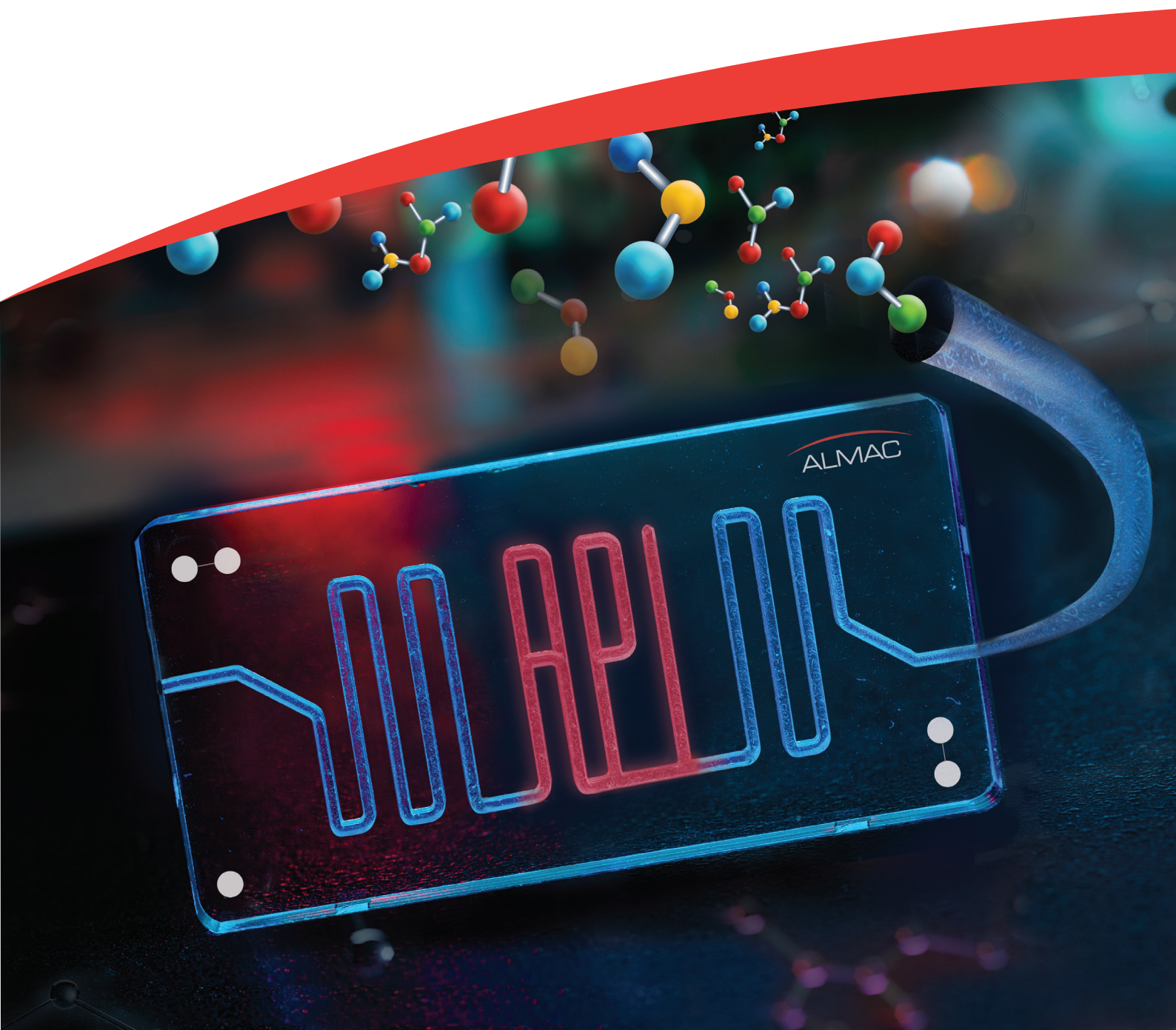


Continuous flow manufacturing capabilities

Development of flow chemistry processes and scale-up to multi-tonne production



Think Almac...

for continuous flow manufacturing



What we offer:

- Proven expertise in developing and piloting flow chemistry processes offering end-to-end flow process development, from laboratory to commercial scale
- Facilities include ATEX-compliant, solvent-compatible flow rigs and seamless integration with batch and isolation equipment at multi-tonne scale
- Excellent security of supply record with multi-national partners

Specific scale-up expertise with:

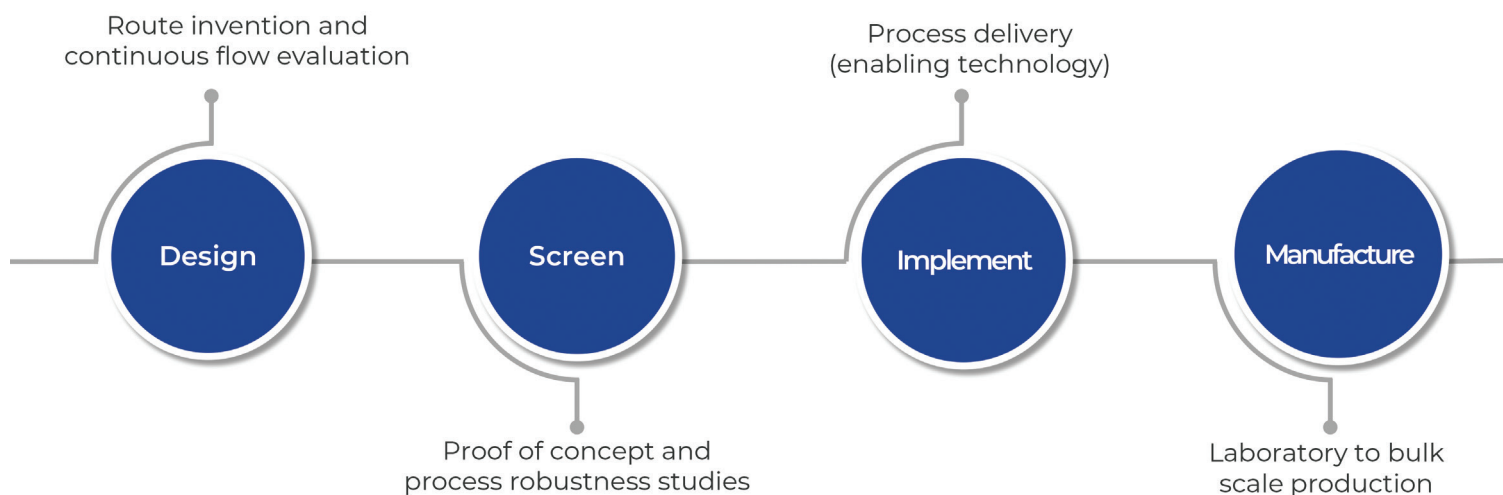
- High pressure/temperature hydrogenation (up to 100 bar / 300°C)
- Low temperature reactions (lithiations at -80°C)
- High pressure and temperature reactions (up to 50 bar / 300°C)
- Bespoke 3D printing of flow chemistry reactors with customised static mixing zones
- Over 20 peer-reviewed papers published on applications of flow chemistry



Flow benefits:

- Overcome operability issues and chemical hazards
- Avoidance of lengthy heat up and hold times
- Enhanced control over reaction and by-product formation
- Access to wider temperature range (-80°C to 300°C) and pressure range (up to 100 bar)
- Future-proof and environmentally sustainable manufacture

Almac offers access to a multidisciplinary team, including chemists, analysts, engineers, safety specialists, automation technicians and project managers.



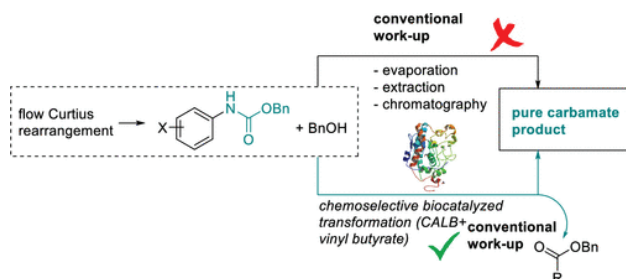
Development capabilities

- Protrix® and Labtrix® technologies
- Vapourtec E-series including LED and electrochemical reactors
- Custom built rigs for low temperature and photochemical transformations
- Spray drying
- Ultra-filtration and dia-filtration
- Liquid-liquid separators
- Microbubble technology
- Continuous stirred-tank reactors, Fischer-Tropsch processing and in-line IR spectroscopy for reaction monitoring

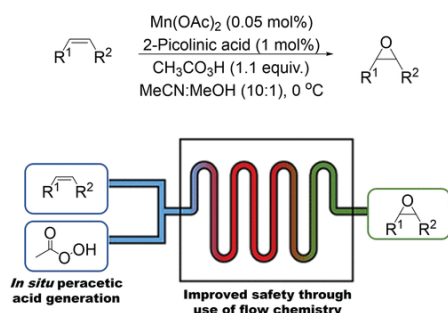


Case studies

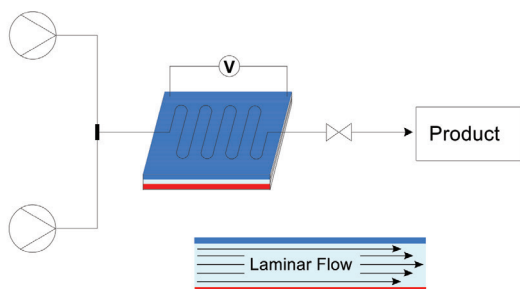
High energy: Curtius rearrangement with BnOH, coupled with chemoselective bioremediation for purification.



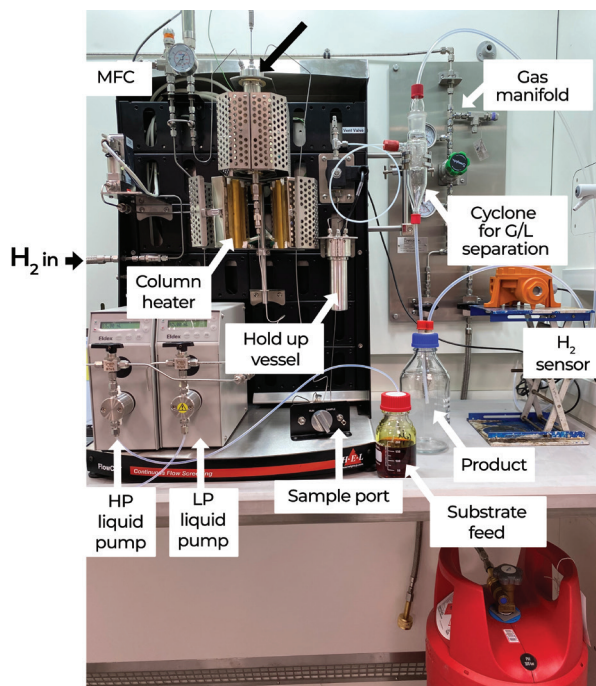
Oxidations: Peracetic acid generated *in-situ* and telescoped directly into epoxidation reaction, thus reducing risks associated with handling and storage, which often limits deployment at scale.



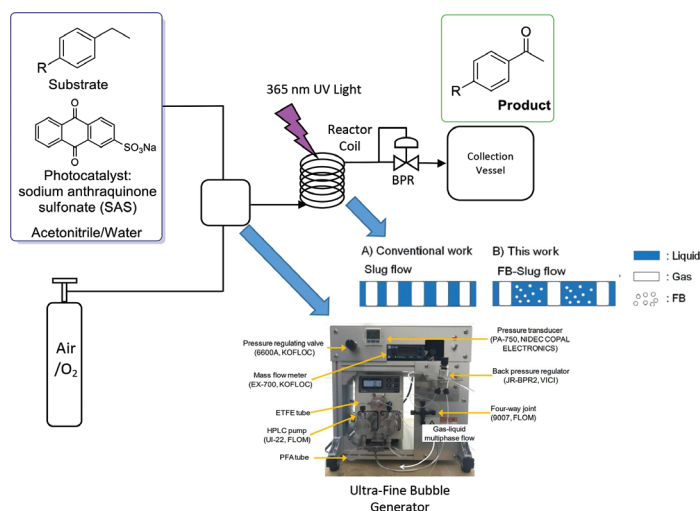
Electrochemical: Anodic oxidations (of phenols, alcohols, aldehydes, Shono-type substrates and others), cathodic reduction (of esters and amides), and reactions in the presence or absence of redox mediators.



High pressure: Nitroreductions, reductive deuterations, alkene saturation. Manufactured at tonne scale.



Photochemical: Selective photooxidation of alkylbenzenes using ultrafine bubble technology, brominations and [2 + 2]-cycloadditions.



almacgroup.com

Get in touch

Global HQ
+44 28 3833 2200

US HQ
+1 215 660 8500

Athlone, Ireland
+353 90 644 5700

flow@almacgroup.com