

Supercritical Fluid Processing Technologies/Services from IIT Bombay

Supercritical Fluid-based (SCF) Processing has been a significant research focus at the Department of Chemical Engineering at IIT Bombay for over three decades. The principal areas of research are:

- Extraction of natural products
- Purification of extracts / concentration of active ingredients
- Drying / removal of residual solvents from pharmaceuticals
- Micronization of high-value nutraceuticals and pharmaceuticals
- Drug encapsulation
- Preservation of liquid and solid foods
- Reactions in supercritical fluids
- Pressurized Water-based extraction processes for natural medicinals and nutraceuticals

Apart from the study of a large variety of specific systems requiring SCF processing, the research experience has been translated into development of *process* and *engineering designs* of SCF systems (bench top to commercial scale) for:

- (i) *SCF-based extraction of natural products (spices, medicinal herbs, natural colours, flavours and fragrances, etc.)*
- (ii) *SCF-based micronization of nutraceuticals and pharmaceuticals*

Technology Consultation

Working for over a decade on the various aspects of SCFET, the research group at IIT, Bombay, has acquired substantial knowledge-base and can offer specialized services as:

- ◆ Process Optimization
- ◆ Selection / Choice of Viable Products
- ◆ Selection of Optimum Plant Configuration
- ◆ Trouble shooting and Re-Engineering of the existing SCFE plants

Generation of Extracts for Test Marketing

The bench and pilot - scale SCFE facilities are available for the generation of extracts of the customers' choice, so as to enable test marketing for the assessment of extract quality and market price

Contract Research

The IIT, Bombay research team undertakes both fundamental and applied research in diverse areas of supercritical fluid technology. The comprehensive technical knowledge base, creativity and commitment to excellence that the team offers, is at par with the best available internationally

Mode of interaction with the Industry:

Work for the industry is carried out either in the form of sponsored research projects or as consulting assignments. Both form of research are subject to norms recommended by the Industrial Research and Consultancy Centre (IRCC) of IIT Bombay, and are subject to specific policies relating to *Intellectual Property* that may be generated during such research and any related *Transfer of Technology*. Details of such policies are available at the IRCC website: <http://www.ircc.iitb.ac.in/IRCC-Webpage/>

Consulting assignments for the industry is typically executed in five consecutive phases:

- (i) **Phase 1** involves experimentation using available SCF processing setups (that range from bench top to pilot scale) towards the production of samples with desired specifications. Such products are made available to the concerned industry for *test marketing*. In all such instances the preferred raw material for processing need be provided by the industry.
- (ii) **Phase 2** involves *preliminary feasibility analysis* for commercial scale operation for a set of multiple products. IIT Bombay may provide assistance in the form of *technical and economical viability* from the findings of Phase 1 and for *selection of a set of viable products*.
- (iii) **Phase 3** involves generation and transfer of *basic process design* for **bench top / pilot / commercial-scale of operation** which would provide the basis for detailed engineering of the SCF production setup / plant.
- (iv) **Phase 4** involves transfer of the process 'know-how', i.e., the *optimized* process conditions for obtaining the product on a commercial-scale.

- (v) **Phase 5:** In continuation of the above phases, detailed engineering and commercial fabrication may be carried out by the client directly, or through suitable vendors/suppliers. During such an activity IIT Bombay may provide *expert assistance to concerned vendors*, if needed. Depending on the specific process and design developed in phases 1-4, IIT Bombay may be in a position to suggest possible vendors for the manufacture of the SCF setup.

Progression of above phases occurs on the request from the concerned client. The above demarcation into phases is primarily for helping a client reach appropriate decisions in keeping with its interest/goal. However, IIT Bombay follows a flexible approach in the executing (and, if required, converging) the above phases, depending on the specific needs of a client.

Meeting IIT Bombay faculty for consultation:

All meetings with IIT Bombay SCF-research faculty group may only be by appointment, set up through either email communication or telephonic discussion. Without prior appointment, consultation may be declined. *IIT Bombay does not provide ad hoc estimates of SCF equipment or of commercial project costs without the completion of the assessment process comprised of at least phases 1- 3.*

Financial Charges:

Each phase of work for an industrial client is assessed separately for arriving at the total charges for its execution. This typically includes the institutional overheads (based on the extent of use of research facilities) and faculty consultation fees. The minimum consultation charge is Rs 10,000/-.

Contact:

The Principal R&D Team Members from IIT Bombay are faculty with the Department of Chemical Engineering

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