XPURE
innovative continuous chromatography

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#Application Note: Role of EBA And SMB in Organic/Amino Acid Production

Several organic and amino acids have found applications as specialty molecules in food, consumer goods, and pharmaceutical industries. Itaconic Acid (IA) is a 5 carbon dicarboxylic acid produced through bacterial fermentation and used as an important building block for biopolymers. In the case of IA production, downstream processing can account for 30-50% of the overall cost of goods (COGs). Therefore, it requires effective and efficient operations to improve sustainability and cost competitiveness. In this article, we will briefly discuss the role of expanded bed adsorption (EBA) and simulated moving bed (SMB) technologies in the production of IA.

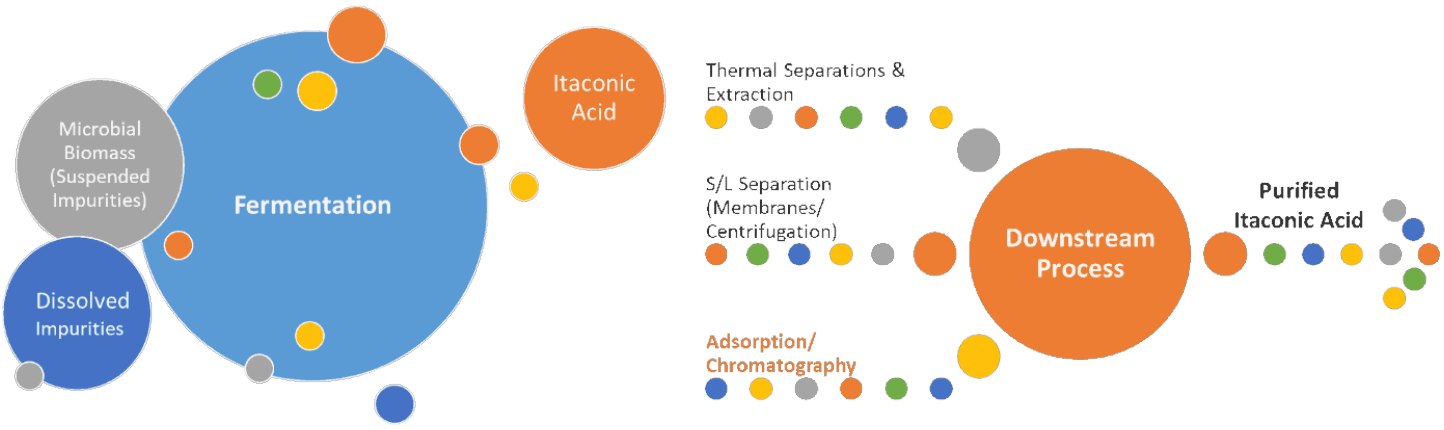

Figure 1. Purification of IA requires a downstream process to separate IA from suspended and dissolved impurities

The basis for selecting a specific unit-operation is defined by desired separation. Typical fermentation output stream contains 5-10% IA, 5-10% impurities, and 80-90% water. Impurities include both suspended solids like biomass and dissolved compounds that are produced as cometabolites. Though precipitation is an easy method for IA purification, it

results in formation of byproducts and limits product purity. Therefore, instead of precipitation, adsorption using a chromatography resin is a preferred alternative. However, feed for packed bed chromatography columns needs to be free of suspended solids and this requires additional unit operations for clarification, resulting in yield losses and higher costs. To overcome these limitations, Expanded Bed Adsorption (EBA) can be applied. EBA is an integrated adsorption process where the product is selectively captured by fluidized adsorbent beads from unclarified fermentation broth, thereby enabling removal of both suspended and soluble impurities in one step.

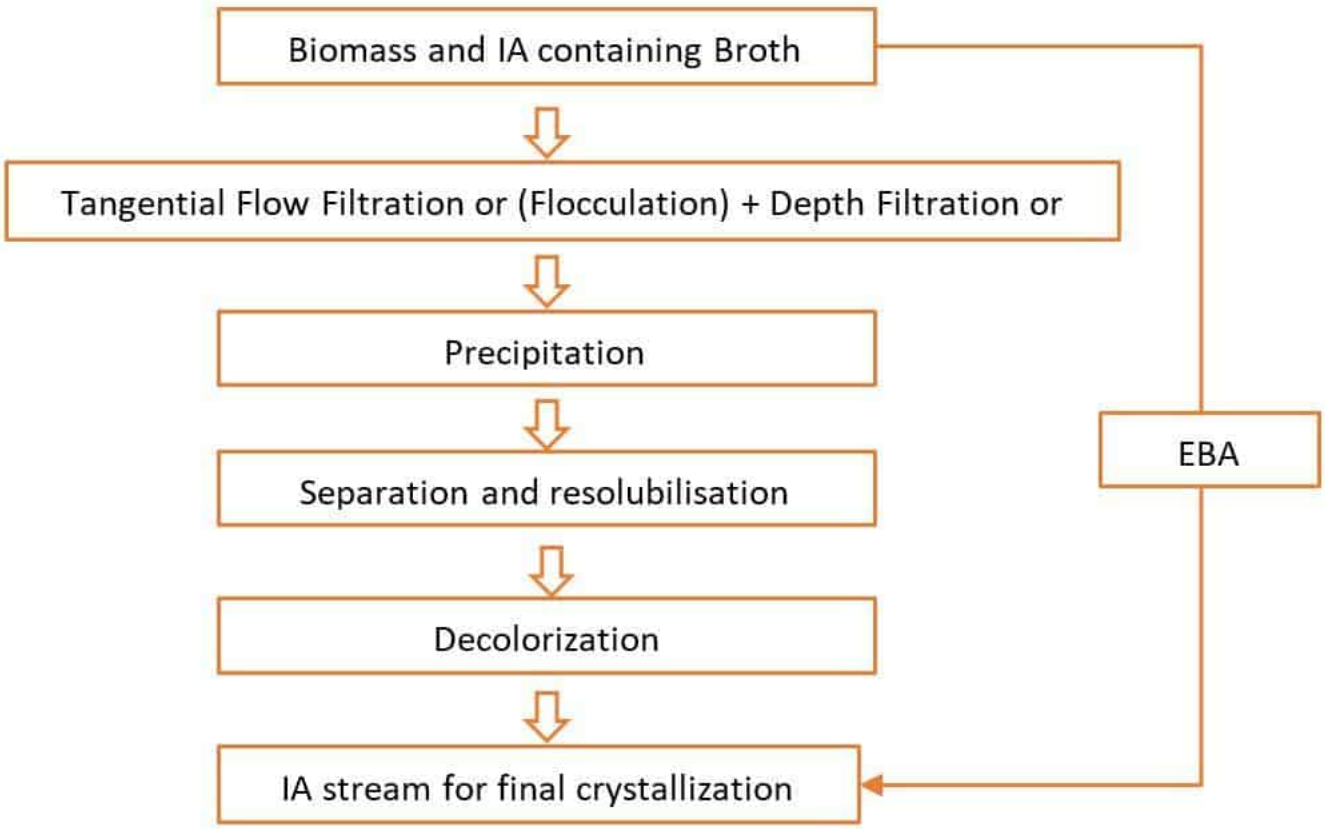

Figure 2. EBA process

Successful EBA process can achieve desired product purity with high recovery yields using 30-60% less number of unit-operations. In addition, it is easier to scale EBA for large-scale production processes with several kilotons annual capacity, due to no pressure drop limitations. However, it is important to note that application of EBA on a large scale can lead to large side streams, which require processing before recycling or release into the environment. Additionally, fluid distribution and hydrodynamic performance of EBA may result in reduced dynamic binding capacity compared to packed bed. A prudent approach to overcome these limitations is by operating EBA in SMB mode.

In conclusion, EBA in combination with SMB mode enables continuous operation, reduced number of downstream steps, improved resin + buffer utilization and enhanced productivity, which makes it a techno-economically viable technology for IA production process. For more information on the EBA and SMB technologies, please Contact Us.