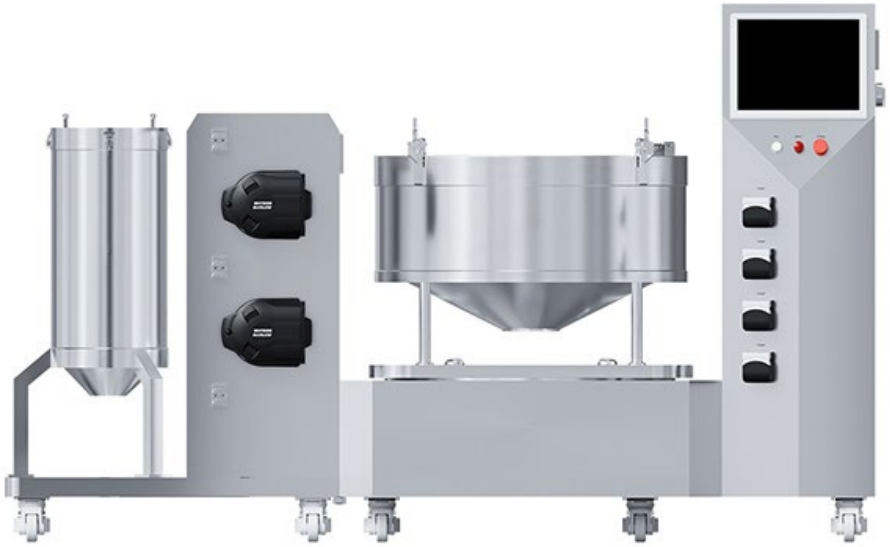
adherent cell culture bioreactor for biopharmaceuticals

The adherent cell culture bioreactor integrates a new type of flake carrier, perfusion culture module and real-time on-line monitoring system on the basis of the traditional air-lift bioreactor.

Adherent Cell Culture Bioreactor Overview

Adherent cell culture bioreactors typically contain a mixing and mass transfer module, an on-line parameterization system, a culture module, and a lamellar immobilized carrier. Cells are adhered to the surface of the carriers, and the culture solution is continuously or intermittently perfused and flowed through the carriers to ensure nutrient supply and metabolic waste removal, thus realizing high cell density culture. The adherent cell culture bioreactor provides a low shear, stable and controlled growth environment for mammalian cells, stem cells, etc.



Features

- New flake carrier structure: the internal configuration of multi-layer flake fixed carrier, the material has both good biocompatibility and surface hydrophilicity, which is conducive to cell attachment, growth and differentiation. The carriers are compactly arranged, providing a large specific surface area.

- Perfusion Continuous Nutrient Supply System: Continuous supply of fresh culture medium through external perfusion, while removing metabolic products to maintain the stability and vitality of the cell growth environment.
- Low-shear flow field design: Air-lift mixing system ensures uniform flow of culture solution between the sheet carriers without generating harmful shear force to the cells, suitable for mechanically sensitive cell types.
- Multi-parameter automatic control: support pH, temperature, dissolved oxygen, flow rate and other online real-time monitoring and closed-loop feedback control, users can flexibly adjust the operating parameters according to the cell metabolic state.
- Modular integrated structure: each module is independently designed, can be quickly disassembled for cleaning or replacement of components, supports a variety of culture bags or carrier programs, can be upgraded to a disposable reactor system.

Working Principle

1. The core of adherent cell culture bioreactor lies in adsorbing cells on the surface of solid carrier and realizing dynamic feeding and waste liquid exchange through external circulation perfusion.
2. Sheet carrier internal fixation: cells are seeded on the carrier surface with coating, and the initial static period promotes cell attachment.
3. Perfusion module operation: culture fluid is transported from the reservoir to the reactor interior by a circulation pump, and passes through the carrier layer through the infiltration structure, which provides continuous nutrient and gas exchange.

4. Gas-liquid mass transfer control: gases are added in the form of membrane contactor or microbubbles, and the oxygen transfer efficiency is high, and at the same time, combined with the dissolved oxygen probe for feedback regulation.
5. Automatic environmental regulation and control: pH, DO, temperature, etc. through the sensor to collect real-time data, the controller to the heater, carbon dioxide gas valve, electromagnetic pump and other components to adjust the instructions, so that the environmental conditions are always maintained in the target range.
6. Cell harvesting: after the termination of the culture, the recovery of adherent cells can be achieved through enzymatic digestion or mechanical means, suitable for the subsequent separation of purification or Functional experiment.
7. The system through perfusion and low shear flow synergistic operation, so that the cells in the long-term culture process to maintain the vitality and metabolic stability, can achieve far more than the suspension culture of the cell density.