

Overview of isolation and separation methods

METHOD	INFORMATION
Distillation	Direct - by boiling point. Indirect – using auxiliary liquid (water, xylene).
Head space	Sampling using gastight syringe of the head space of the gastight closed vial with a sample (liquid, solid) after the establishment of the thermodynamic equilibrium, followed by injection into the gas chromatograph (the possibility of automation using injection loop). Static and dynamic variant.
Purge & trap	Gas purging of analytes from the sample (liquid or solid alternatively covered with a liquid). Subsequently, the analytes are retained in a trap (sorbent tube) or at a cooled point (cryofocustion), from which are released by heating and then introduced into the gas chromatograph. Often a combination trap + cryofocustion. Closed and open system. Automation.
Liquid-liquid extraction (plus microextraction)	Extraction using an immiscible liquid (equilibrium - distribution constant, phase ratio).
Liquid-solid extraction	Extraction using liquid from solid samples.
Microwave assisted extraction	Extraction using liquid – microwave heating of liquid and/or sample.
Accelerated solvent extraction Pressurised liquid extraction	Extraction using liquid at elevated t and p .
Supercritical fluid extraction	Extraction using fluid above critical values of t and p .
Solid phase extraction	Extraction using sorbents.
Solid phase microextraction	Extraction using sorption fiber plus other variants.
Gravity separation	Sedimentation at defined gravity.
Adsorption chromatography	Separation (retention) or clean-up (sorption) using sorbents activated (by heating) and possibly inactivated (specifically by water).
Dispersive solid phase extraction	Clean-up (selective isolation) using dispersed sorbents (MSPD, QUECHERS).
Membrane techniques - dialysis	Separation of analytes based on differences in molecular weight / permeability through a semipermeable membrane. Separation of analytes based on differences in molecular weight and extractability by solvents - throughput through the semipermeable membrane impregnated with an organic solvent.
Restricted access media	Separation of analytes based on retention in and ability to penetrate into the structure of a separation medium with limited access.
Molecular imprinted polymers	Separation using specific polymeric sorbent formed on the basis of the model analytes.
Aptamer-based separation	Separation via interaction with specific molecules formed on the basis of the model analytes.
Gel permeation chromatography	Separation of analytes based on differences in molecular weight - the ability to penetrate into the porous structure of the gel.
Thin layer chromatography	Separation of analytes moved by liquid based on differences in migration in a thin layer of sorbent (gel, paper).

Electromigration methods	Separation of analytes based on different electromobility.
Field Flow Fractionation	Separation of analytes for using orthogonally acting field - such as electrical or thermal.
Liquid chromatography – separation process parameters	Separation of analytes moved by liquid based on differences in migration in (sorbent) column.
Liquid chromatography - sorbents, columns	Details are included in lectures.
Liquid chromatography - detectors	Details are included in lectures.
Supercritical fluid chromatography	Separation of analytes moved by supercritical fluid based on differences in migration in (sorbent) column.
Gas chromatography - separation process parameters	Separation of analytes moved by gas based on differences in migration in (sorbent) column.
Gas chromatography – injection techniques	Details are included in lectures.
Gas chromatography - columns	Details are included in lectures.
Gas chromatography - detectors	Details are included in lectures.
Comprehensive two-dimensional chromatography (GCxGC)	Details are included in lectures.
Mass spectrometric detectors	Separation of charged particles (ions) in a magnetic, electromagnetic, electrostatic, time of flight field.
Combined techniques - on-line systems	Automation of sample preparation and instrumental techniques using their appropriate combinations.