

ORGANIC CHEMISTRY • PURIFICATION TECHNIQUES

Differential Extraction

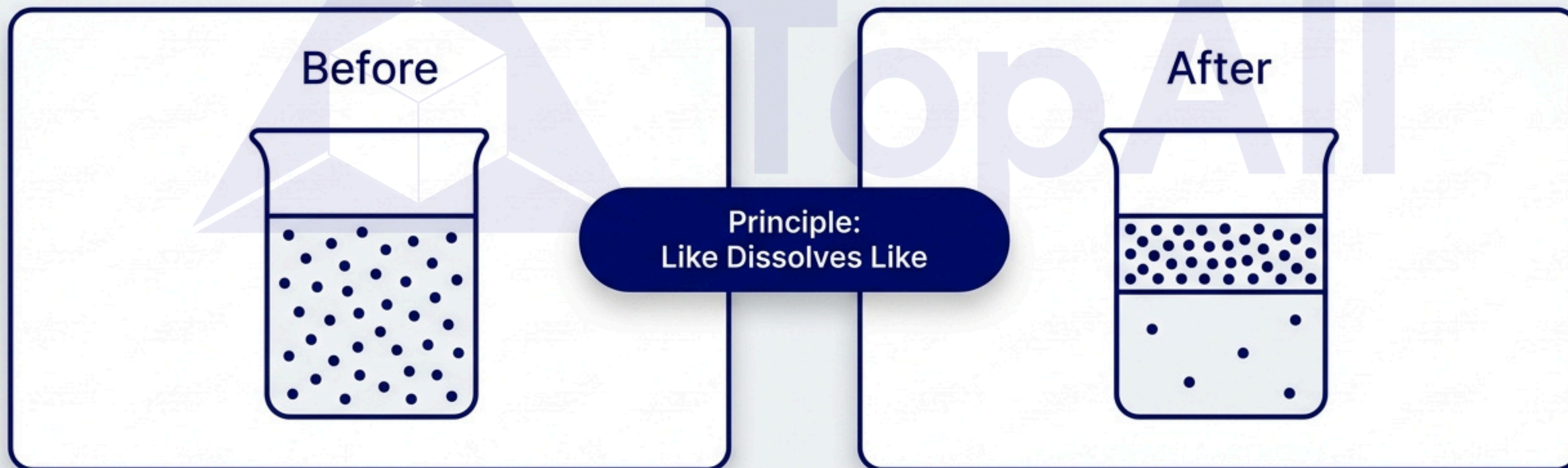
Isolating compounds through selective solubility and immiscible solvents.



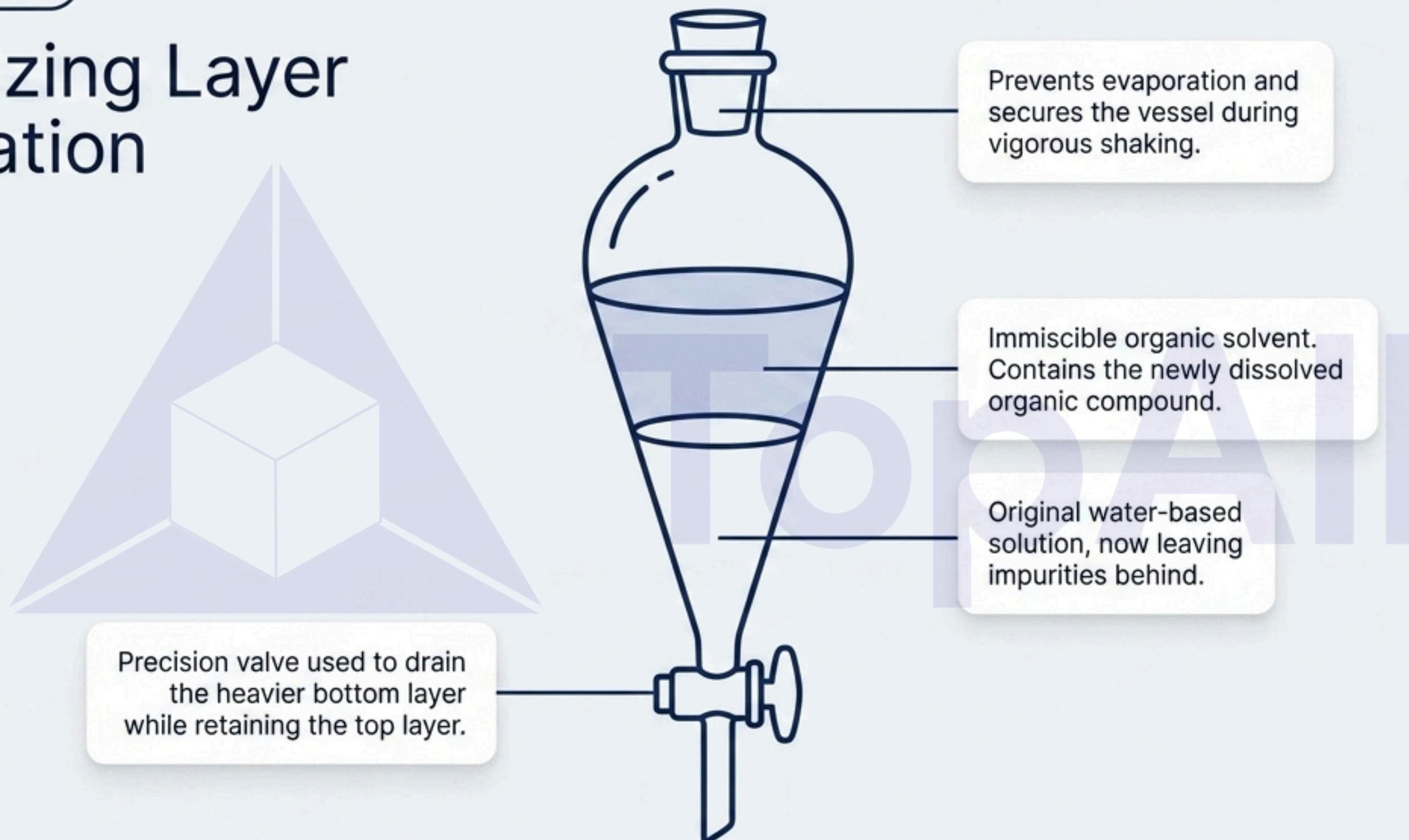
THE FUNDAMENTAL MECHANISM

Separation by Selective Solubility

An organic compound dispersed in an aqueous solution is extracted by adding an immiscible organic solvent. Driven by chemical affinity, the compound preferentially migrates to the organic layer where it is significantly more soluble.



Visualizing Layer Separation



Note: The relative positions of the organic and aqueous layers strictly depend on their respective solvent densities.



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$$E=mc^2$$



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The 4-Step Extraction Process



Add

Introduce an immiscible organic solvent to the original aqueous solution.



Shake

Agitate the funnel vigorously to maximize the surface area for solute transfer.



Settle

Allow the immiscible liquids to sit undisturbed until they separate into sharp, distinct layers.



Drain

Use the stopcock to isolate the layers. Recover the pure compound via subsequent distillation.

Aqueous vs. Organic Solvents

Aqueous Phase	Organic Phase
COMPOSITION Water + Impurities	COMPOSITION Immiscible Organic Solvent
SOLUTE AFFINITY Low solubility for target compound	SOLUTE AFFINITY High solubility for target compound
TYPICAL DENSITY Usually heavier (forms bottom layer)	TYPICAL DENSITY Usually lighter (forms top layer)*

*Exception: Halogenated organic solvents (like dichloromethane) are denser than water and will form the bottom layer.

Key Takeaways



Immiscibility is non-negotiable. The organic solvent and aqueous solution must absolutely not mix; physical layer separation is the foundation of the technique.



Driven by differential solubility. The target compound must be significantly more soluble in the chosen organic solvent than it is in water.



Continuous Extraction contingency. If the target compound has stubbornly low solubility even in the organic solvent, the continuous extraction technique must be employed to avoid wasting massive volumes of solvent.



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