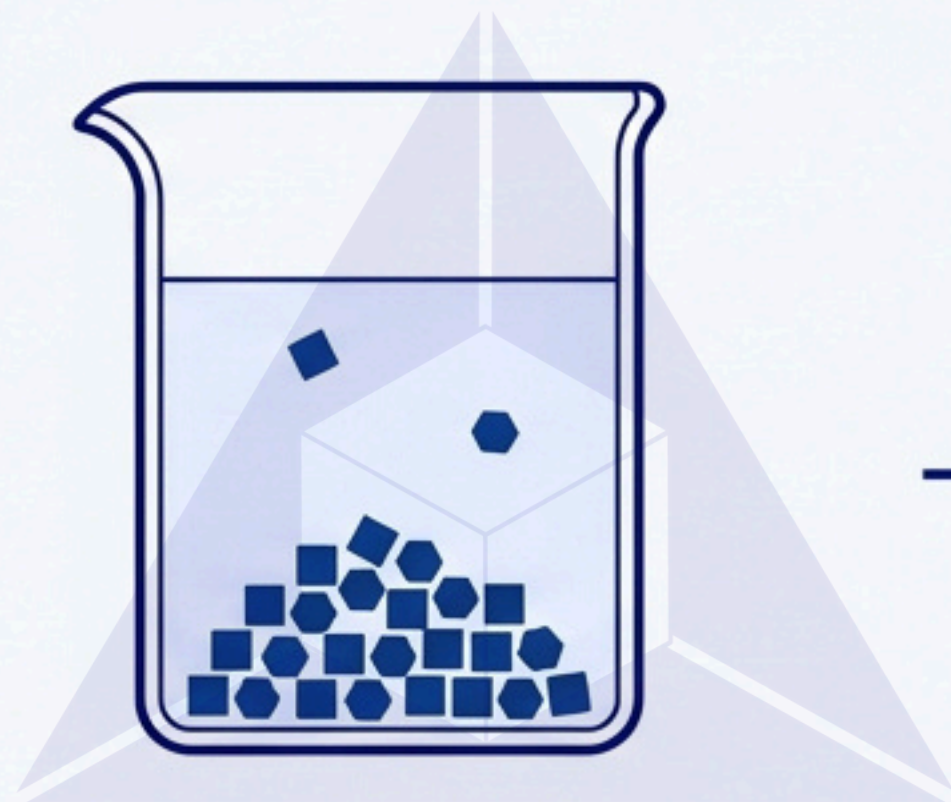
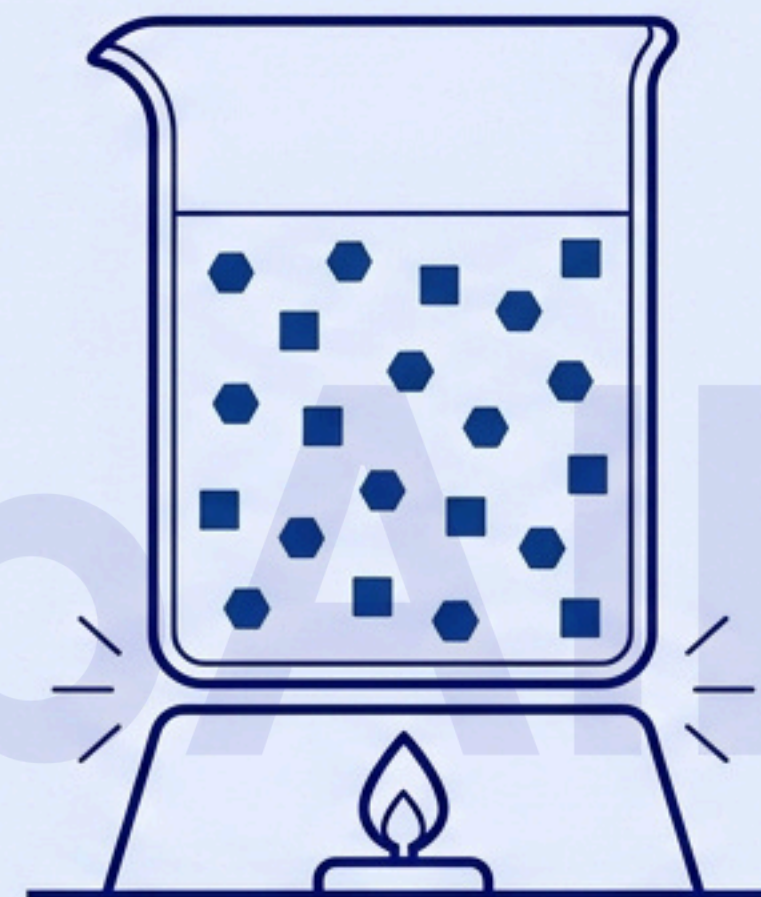
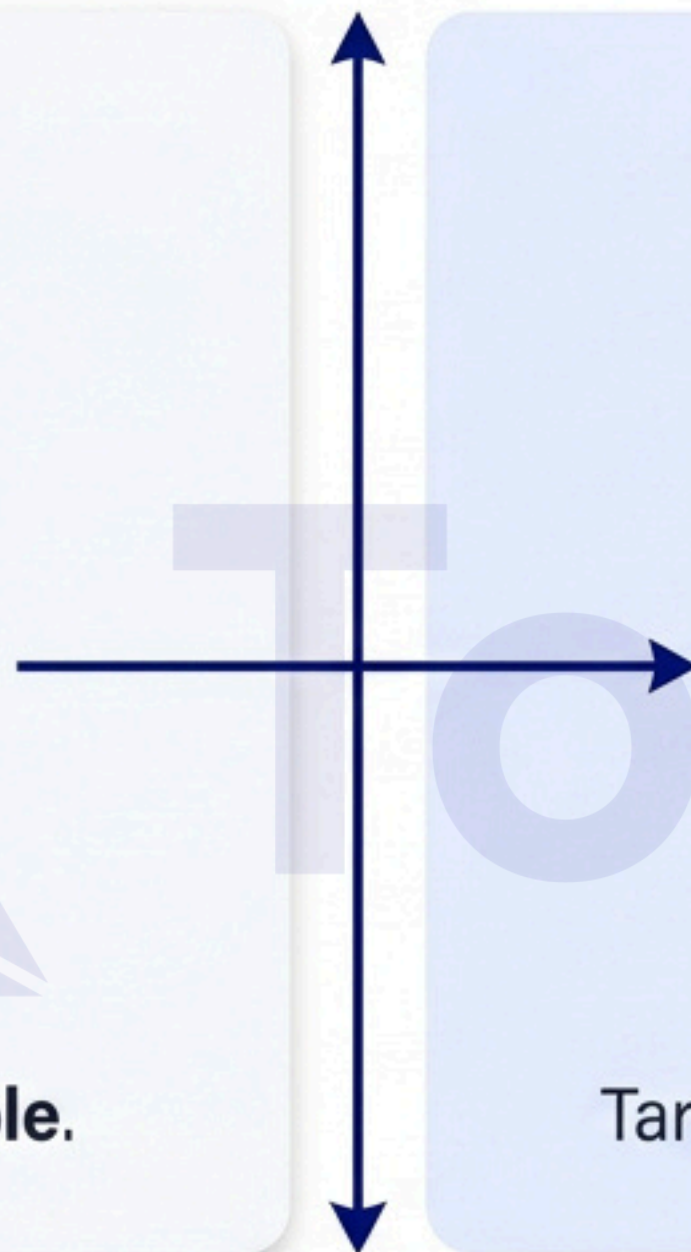


The Principle of Differential Solubility



Target compound is **sparingly soluble**.



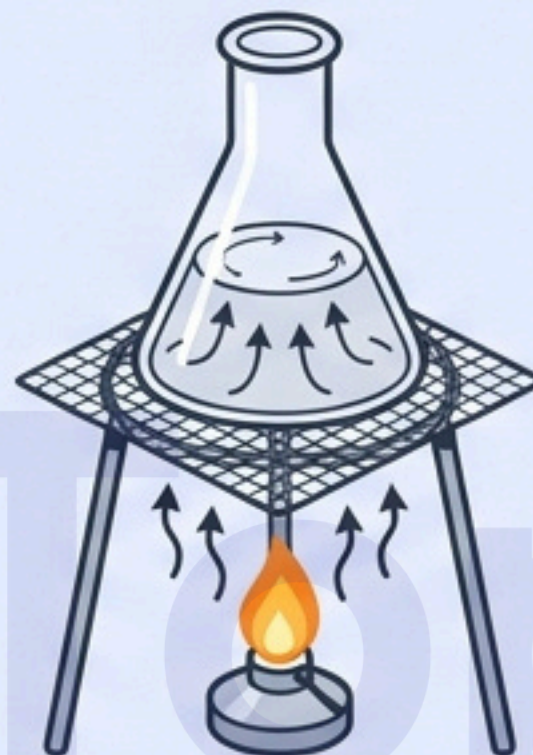
Target compound is **appreciably soluble**.

The foundational rule of crystallisation: The chosen solvent must exhibit a steep temperature-solubility gradient for the impure solid.

Step 1: Initial Dissolution in Hot Solvent



Impure Solid + Selected Solvent.



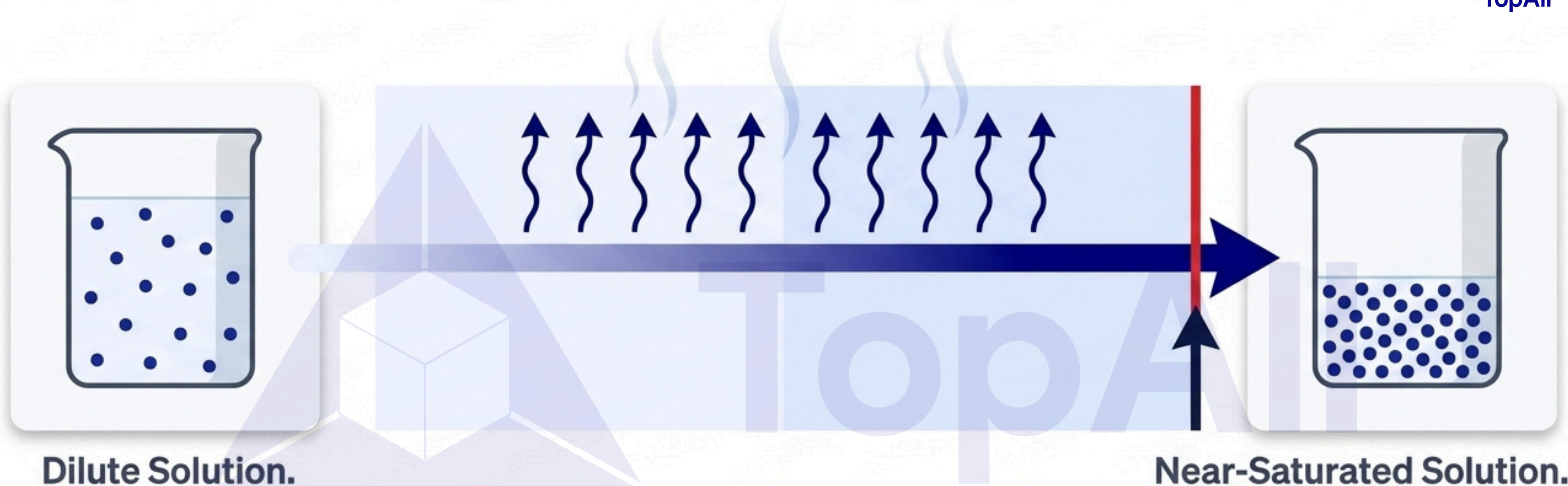
Heat Applied.



Hot, Dilute Solution.

The Critical Choice: A suitable solvent dissolves impurities either at room temperature (leaving the target solid intact) or only at high temperatures (dissolving everything to be separated later).

Step 2: Reaching the Solubility Threshold



What is “Near-Saturated”?

The critical tipping point. The solution is concentrated until the target compound is pushed to the absolute edge of its solubility limit. Cooling it now guarantees precipitation.



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$$E=mc^2$$



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Key Highlights

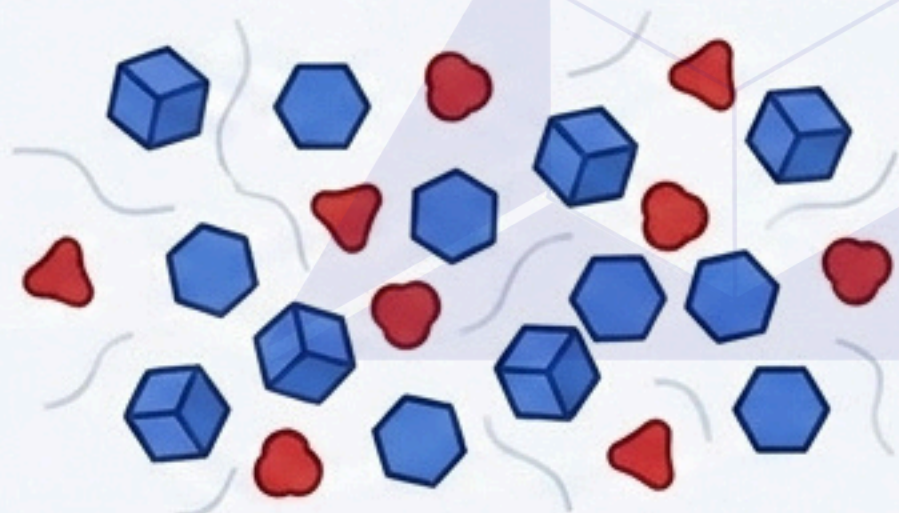
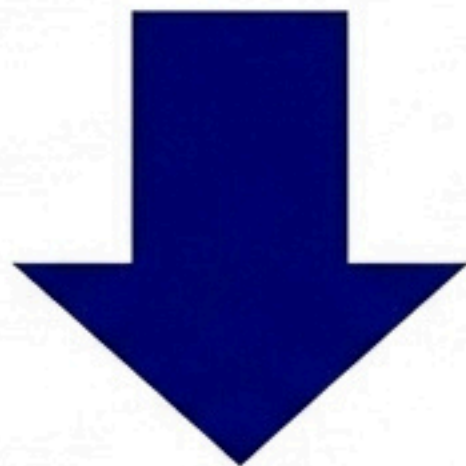
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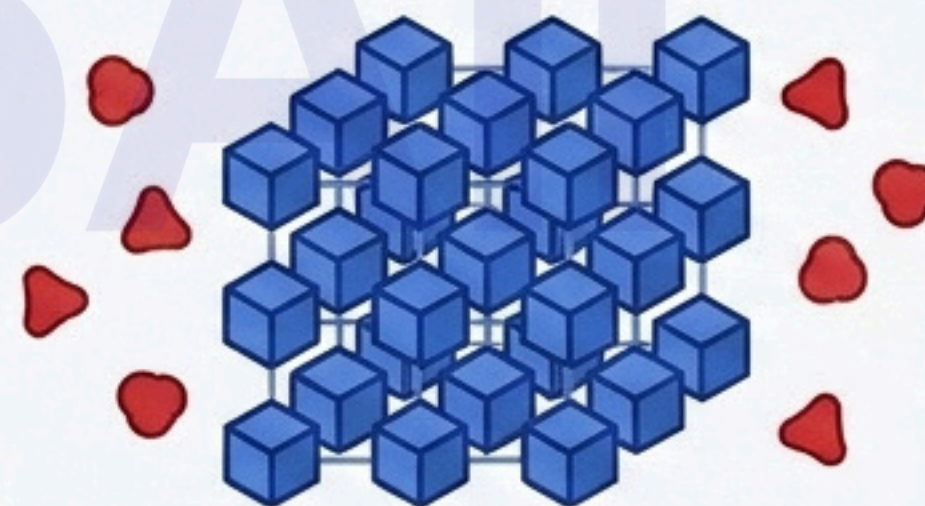
Step 3: Cooling and Geometric Purification

Kinetic energy drops.

Solubility decreases rapidly.



Disordered Soup



Perfect Crystal Lattice Assembly

As the perfect lattice assembles, poorly-fitting impurity molecules are naturally excluded and remain dissolved in the surrounding solvent.

Step 4: Filtration and Refinement

The Retentate



The Crystals: Pure target compound, recovered as a highly ordered solid.

The Filtrate



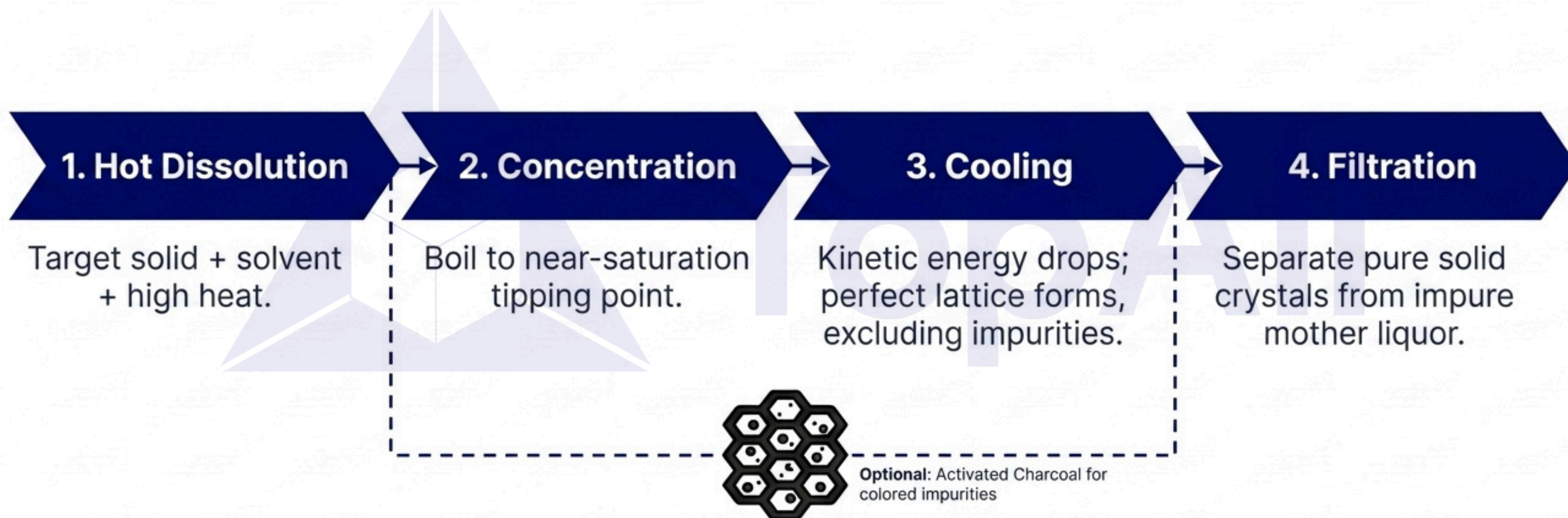
The Mother Liquor: Saturated liquid containing the excluded, highly soluble impurities



The Charcoal Intervention

What if the solution is contaminated with organic colorants? The hot solution is boiled with **activated charcoal**, which selectively adsorbs colored impurities onto its highly porous surface before filtration.

The Crystallisation Blueprint





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