Development Layer System

Hydroquinone derivatives (e.g., Metol）

Reaction:



Steps:

1. Methylation:

React p-aminophenol with dimethyl sulfate in alkaline solution.

1. Neutralization:

Add sulfuric acid to form the sulfate salt (Metol).

1. Purification:

Recrystallize from ethanol/water to remove unreacted aminophenol.

Gelatin

Steps:

1. Pre-treatment:

Cleaning and degreasing animal tissues to remove impurities.

Acid/alkali treatment (e.g., soaking in HCl or NaOH) to break down collagen fibers.

1. Hydrolysis:

Heating collagen in water (60–90°C) under acidic/basic conditions to cleave peptide bonds.

Enzymatic hydrolysis (optional) for controlled degradation using proteases.

1. Filtration:

Removing insoluble residues (e.g., bone fragments, fat) via vacuum filtration.

1. Concentration:

Evaporating water under vacuum to concentrate gelatin solution (~20–30% solids).

1. Drying:

Spray drying or drum drying to produce granulated/powdered gelatin.

1. Quality Control:

Testing for gel strength, viscosity, and purity (e.g., ash content <2%).

Back Membrane Layer

Terephthalic Acid (PTA)

Steps:

1. Oxidation Reaction:

Reaction: P-Xylene is oxidized with oxygen in acetic acid medium at 150–220°C and 10–20 bar pressure.

1. Crystallization & Separation:

Crude TPA crystallizes from the reaction mixture, filtered, and washed to remove impurities (e.g., 4-carboxybenzaldehyde).

1. Purification (Hydrogenation):

Residual byproducts (e.g., terephthalic acid dimers) are hydrogenated using palladium catalysts at 200–250°C and 20–30 bar H₂​​.

1. Drying & Packaging:

High-purity PTA (>99.8%) is dried under vacuum and pelletized for polyester production.

Polyvinyl Alcohol (PVA)​

Steps:

1. Polymerization of VAM:

Free-Radical Polymerization: VAM is polymerized in methanol/water mixtures at 60–70°C using AIBN as initiator.

1. Solvent Recovery:

Unreacted monomer is stripped off, and PVAc is precipitated in methanol.

1. Partial Hydrolysis:

Acid-Catalyzed: PVAc is heated with dilute sulfuric acid (1–5 wt%) at 80–90°C for 2–4 hours​​ to hydrolyze ~87–99% of acetate groups.

1. Neutralization & Washing:

Hydrolyzed PVA is neutralized (pH 5–7), washed to remove residual catalysts, and dried.

1. Finishing:

PVA is ground into powder or dissolved in water for film/sheet production.

Support Layer (PET Substrate)​

PET

Steps：

1. Reaction 1: Esterification (if using DMT）



1. Reaction 2: Polycondensation​

Polymerize BHET or PTA + EG under high temperature/pressure to form PET polymer chains



1. Melt Extrusion​​

Melting: PET polymer is melted in an extruder at ~290°C.

Filtering: Remove contaminants (e.g., undissolved particles) using a melt filter.

Pelletizing: Cool and cut the molten PET into uniform pellets for storage/transport.