THE TECH CENTER THIN FILM PROCESS

In the 1970s, Hewlett-Packard (HP) utilized a hybrid approach to create microcircuits on sapphire substrates, combining thin-film deposition and discrete component attachment.

Here's a breakdown of the process:

1. Sapphire Substrate Preparation:

- HP used single-crystal sapphire wafers as the base for their circuits.
- These wafers needed to be precisely oriented and polished to achieve the required surface quality for thin-film deposition.

2. Thin-Film Deposition:

- Thin films of conductive materials like gold, chromium, or nichrome were deposited onto the sapphire substrate.
- Techniques like sputtering or evaporation were likely used for this purpose.
- These thin films formed the conductive traces and resistive elements of the microcircuit.

3. Patterning the Thin Films:

- Photolithography was used to define the precise patterns for the conductive traces and resistive elements.
- A photoresist layer was applied to the thin film, exposed through a mask, and then developed to create the desired pattern.
- The exposed thin film was then etched away, leaving behind the patterned microcircuit elements.

4. Attaching Discrete Components:

- Discrete components like transistors, diodes, and capacitors were fabricated separately and then attached to the patterned thin film circuitry.
- These components were typically bonded to the thin film using methods like wire bonding or flip-chip bonding.

5. Encapsulation and Packaging:

• The completed hybrid microcircuit was then encapsulated and packaged to protect it from the environment and allow for easy connection to the rest of the system.

In summary, HP's process involved carefully depositing and patterning thin films on a sapphire substrate, then adding discrete components to create a functional microcircuit.