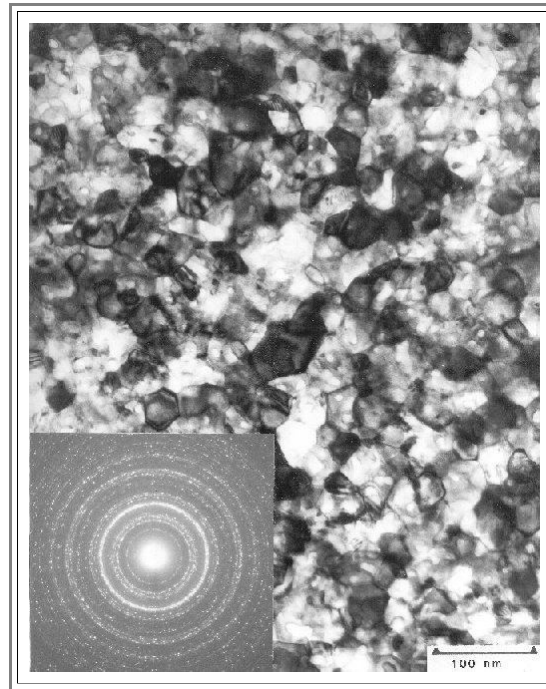


PtSi Silicide on Silicon

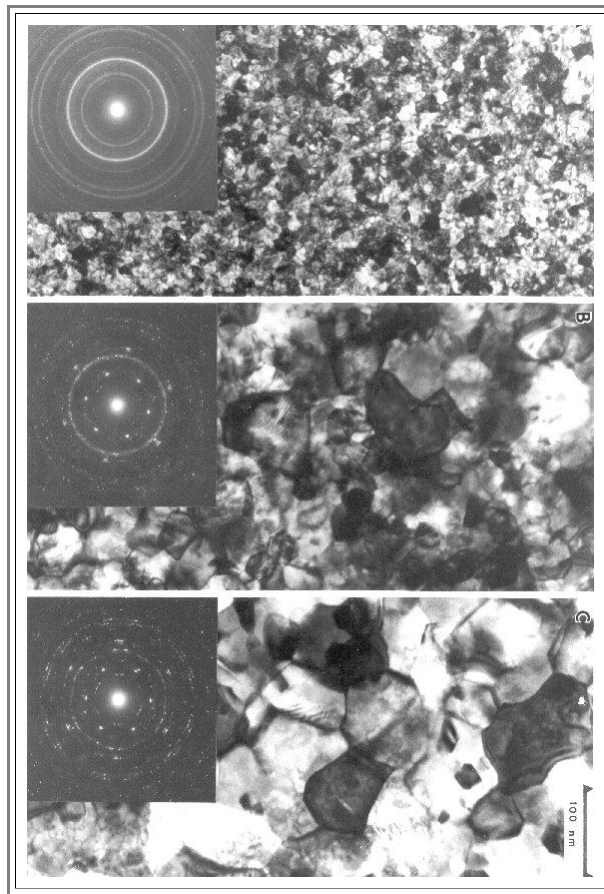
Illustration

Metal Silicides play an important role in microelectronics. **PtSi** has been used in bipolar technology for quite some time; other silicides abound in **MOS** techniques.

- Silicides are usually formed by evaporating a thin metal layer (here **Pt**) on a **Si** substrate, which is subsequently annealed at some high temperature; say **800 °C**. Silicides form by solid state reactions, the picture below shows one result. A fine grained film of **PtSi** has formed in this case.
- The picture illustrates that in polycrystalline materials the images are dominated by grain boundaries. The contrast conditions are pretty random and different in every grain. Not much can be seen.
- The diffraction picture, shown as an insert, often provides more important information than the direct image. It consists of many reflexes arranged in rings; typical for polycrystalline materials. Every spot comes from one grain that happens to meet the Bragg condition for the particular reflex.



- Increasing the annealing time or the annealing temperature makes the **PtSi** film more coarse grained; this is easily seen in the sequence below. But only the diffraction image shows that an epitaxial relationship to the Si substrate develops at high temperatures.



In the top picture the grains are so small that their diffraction pattern forms structureless rings. In the two lower pictures, however, some grains are still at a random orientation producing reflexes somewhere on the rings, but many grains have the same orientation producing strong spots at the same position -there is an epitaxial relationship to the substrate. This can be seen by closely inspecting the diffraction pattern: The spots from the epitaxial **PtSi** grains are almost coincident with the **Si** spots.