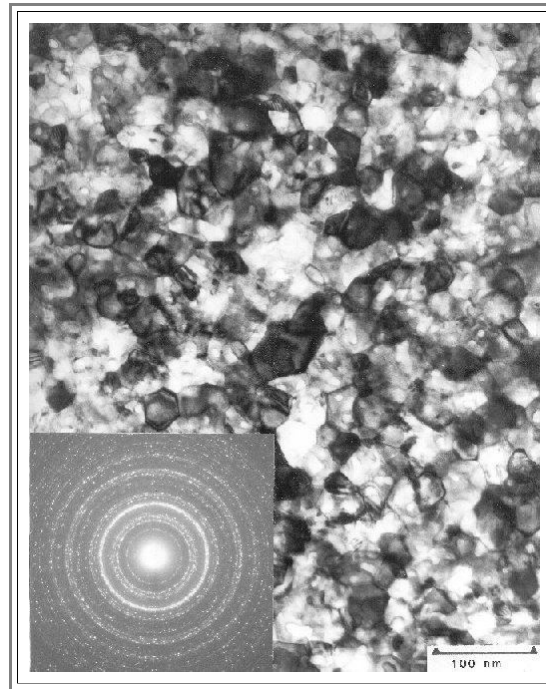


PtSi Silicide on Silicon

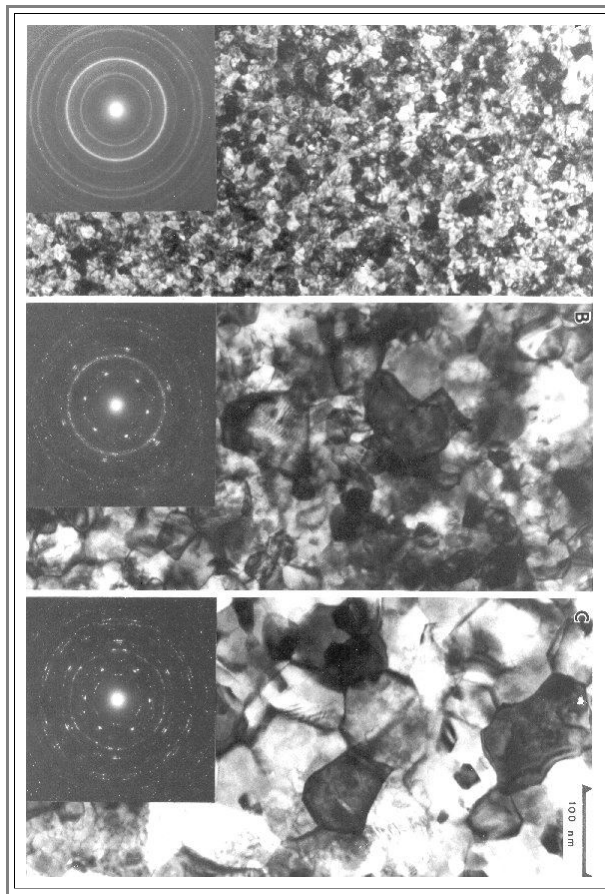
Illustration

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.