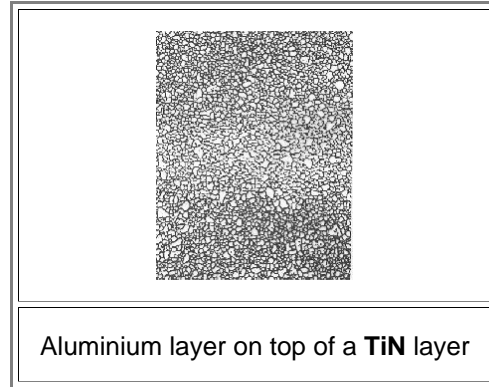
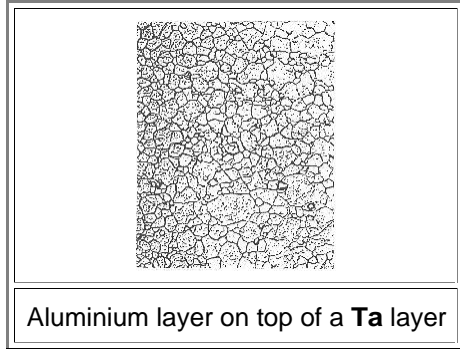


## Al Grain Structure on Different Substrates

### Illustration

Around the late eighties, the necessity came up to use a **diffusion barrier** between the **Al** - metallization and the **Si** substrate because the reaction of **Al** with the **Si** in contact holes with cross sections  $< 1 \mu\text{m}^2$  became a problem. One material of choice was **TiN**, another one **Ta**.

- The grain structure of the **Al** layer (and with it other properties, e.g. the electromigration resistance, depends significantly on the substrate).
- Below you can see the representative pictures (identical scale) that illustrate this point.



Close examination revealed that the substrate influences:

- Grain size
- Grain size distribution
- Texture
- Degree of **Si** precipitation
- Macroscopic stress
- Microscopic stress

All of these properties may influence the performance of the **Al** conductor - and this gives you an idea of what it means to introduce a new material into a fine-tuned product.