**Sensor Array Testing Using a Temporary Conductor**

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Many applications in medical imaging and science use either one- or two-dimensional arrays of sensor elements such as pixel or strip geometries. Before installation in a system or attachment to read-out electronics it is necessary to test these sensors to ensure their functionality.

This is a simple technique, which involves the deposition and patterning of tungsten to electrically connect the array elements in the desired geometry. Following the testing of the device, the sensor is immersed in hydrogen peroxide. This etches the tungsten completely away in about twenty minutes, depending on the thickness of the tungsten. This reaction proceeds by the oxidation of the tungsten and the dissolution of the resulting tungsten oxides in the bath. This is performed at room temperature. Hydrogen peroxide is a relatively harmless, consumer chemical and is readily available. Upon exposure to light it releases oxygen and becomes water. Hence there are no disposal issues.

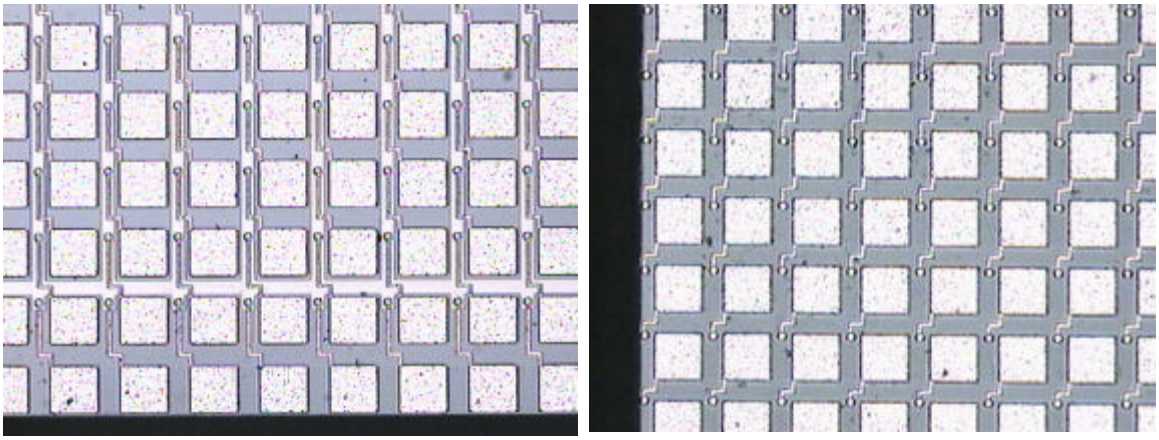

Fig. 1. Photographs of A) pixel array with tungsten shorting strips connecting all cells together and B) pixel array after removal of tungsten in hydrogen peroxide.

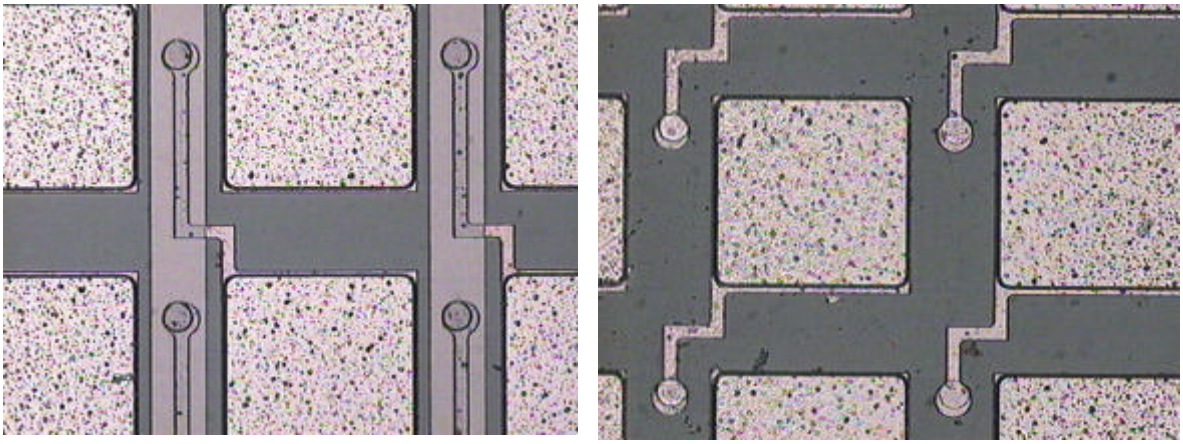

Fig. 2. Close-up view of bump bond pads of four pixels A) with tungsten traces and B) after removal of tungsten traces.

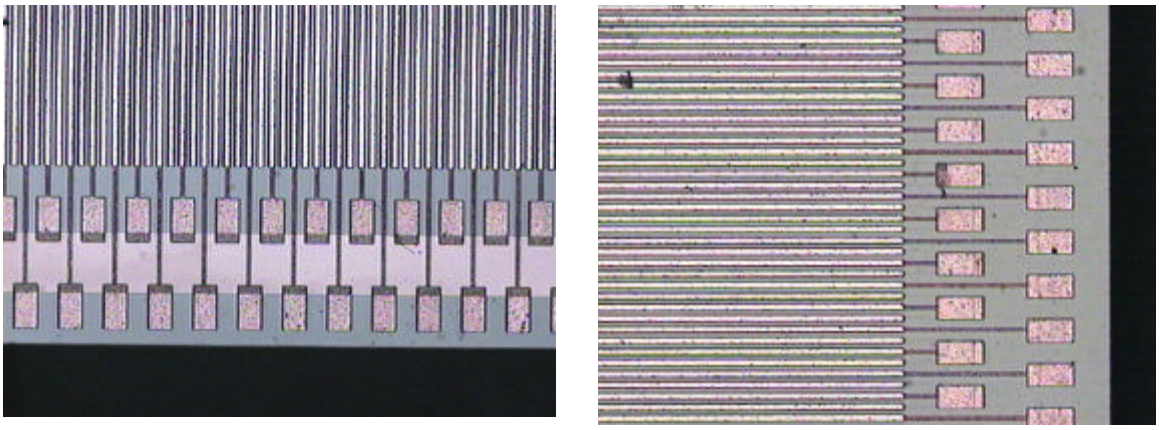

Fig. 3. Strip sensor with 25 micron pitch showing A) with tungsten traces present and B) after removal of tungsten traces.

The tungsten was about 1500 Angstroms thick and had a measured sheet resistivity of about 1 Ohm per square. This was completely etched off in a hydrogen peroxide solution in approximately 30 minutes giving an etch rate of 50 Angstroms per minute.

Measurements were made on the strip sensor shown in Figure 3. The resistance measured between wire bond pads was determined using a multimeter and found to vary between 36 Ohms and 106 Ohms. This depended somewhat on pad separation, but was dominated by contact resistance.

An infrared beam, with a diameter of about 50 microns, was scanned across the sensor. The signal was read out via the end wire bond pad only. The signal level was constant across the device indicating that the tungsten trace formed a conductive path between all the strip diffusions.

After removal of the tungsten traces, the inter-wire-bond-pad resistances were all over 20 megaOhms, which was the upper sensitivity limit of the multimeter used.

This method can save time and resources by enabling the simple testing of large arrays of sensors. The need for large and complex probe cars or the inclusion of special device feature, which may compromise performance, is eliminated. It is easy to sputter tungsten on to wafers and easy to pattern the tungsten using either a wet hydrogen peroxide based etch or a fluorine containing plasma. These temporary tungsten traces should be compatible with most types of bump bonds and so the array can be tested after bump deposition. This technique is not limited to silicon-based detectors.