SEC Hydrogen Gas Purity Validation

Mykrolis

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Purpose

Due to South Epitaxy Corporation (SEC) requirements, Mykrolis was asked to perform moisture and oxygen validation tests on the Aeronex® Hydrogen Gas Purification Systems at SEC in Taiwan. Specifically, moisture and oxygen measurements were needed downstream of an Aeronex GateKeeper® SS10MFH8Y point-of-use gas purifier and downstream of an Aeronex EGPS12H. The Aeronex GateKeeper was used as backup for the Aeronex Gas Purification System. The moisture and oxygen challenge to the purifiers was also measured.

Test Methodology

A Meeco™ Tracer™ Moisture Analyzer was used to measure parts-per-billion (ppb) levels of moisture. The Tracer has a lower detection limit (LDL) of 1ppb. The extremely sensitive phosphorus pentoxide sensor of the Meeco Tracer allows single digit ppb moisture measurement. A Delta F™ Nanotrace™ Oxygen Analyzer was used to measure parts-per-billion levels of oxygen in the hydrogen gas stream. The Delta F Nanotrace has a LDL of 0.2ppb oxygen. The oxygen sensor uses the process of electrolysis to measure down to 0.2ppb oxygen.

The analytical instruments were initially set up in the gas room at SEC and allowed to stabilize under a purified nitrogen purge. Once the instruments were stabilized, the test line was back-purged with nitrogen, and then hooked up to the sample port downstream of the Aeronex GateKeeper SS10MFH4R.

The purified nitrogen line was shut off via a valve and the sample gas to the instruments was switched to the test line. Hydrogen was sampled until stable moisture and oxygen readings were obtained. After the test, the instruments were switched back to sample the purified nitrogen. The second test sampled hydrogen from the test port downstream of bed A in the Aeronex Gas Purification System. Once the test line was purged and connected, the sample gas was switched from the purified nitrogen to the test hydrogen. The instruments sampled the hydrogen until stable readings were obtained. The final test measured the moisture and oxygen in the hydrogen supply upstream of any purification. Hydrogen gas from a port upstream of the Aeronex Gas Purification System was sent to the moisture and oxygen analyzers until stable readings were obtained. The test manifold is shown in figure 1.

Results

A summary of the results is shown in figure 1. The results of both purifier tests showed moisture and oxygen readings at or below the detection limit of each instrument. These results definitively validate that both the Aeronex GateKeeper and Aeronex Gas Purification System are performing to specification. When the SEC engineers saw the results, they brought the Aeronex Gas Purification System online and began running their MOCVD process. There was no measurable amount of oxygen in the hydrogen supply gas (upstream of purification). Moisture upstream of purification was measured to be 41ppb H_2O.

Figure 1. Test Manifold

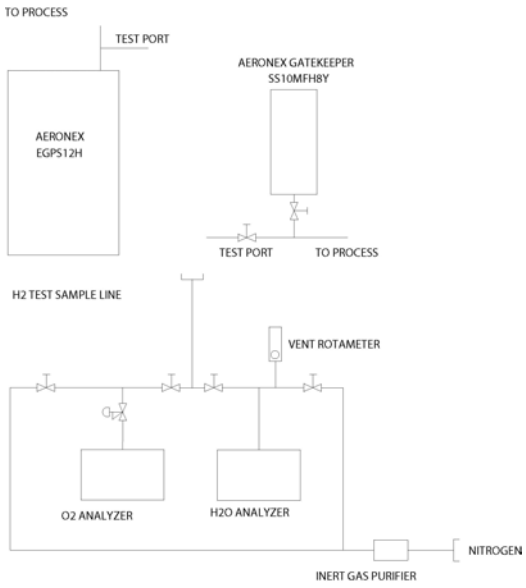

Figure 1. SEC Hydrogen Results

	Moisture	Oxygen
Instrument	Meeco Tracer	Delta F Nanotrace
Lowest Detection Limit	1ppb H2O	0.2ppb O2
Aeronex GateKeeper SS10MFH8Y	1ppb	0ppb
Aeronex EGPS12H	0ppb	0ppb
Hydrogen Supply Gas	41ppb	0ppb

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