Technical Note: 10000042

Using the MDC-360 for Co-Deposition

Even though the MDC-360 wasn't designed to perform co-deposition, it is easily accomplished by using one 360 to control each source and connecting the 360's together via the programmable inputs and outputs. Basically you setup one 360 as the master and the second as the slave where master tells the slave when to start and when to stop deposition. During the alloy layers, each 360 controls its own source adjusting the power as needed to achieve the programmed rate.

Sensorhead Configuration

To perform co-deposition, you want to orientate each sensor head so that it is only exposed to the vapor coming from the source it is controlling. Typically, this is done through the use of collimator tubes or shielding. When this is done properly, you get better control because you eliminate cross talk and you don't have to worry about the density and acoustic impedance of the alloy since you are simply controlling two separate sources at the same time.

Programming

The first step in programming the two 360's is to establish the necessary inputs and outputs so the master can start and stop the slave during the alloy layer.

Slave Inputs

First, create the following inputs on the slave controller.

- Name - "Start Layer"
- Name - "Stop Layer"

Now link each input to an action by including it in the action's Condition string.

- Action Name - "Start Process"; Conditions - "Start Layer" (input)
- Action Name - "TerminateDeposit"; Condition - "Stop Layer" (input)

Master Outputs

The next step is to create the Master's outputs so it can start and stop the slave.

- Name - "Start Slave"; Conditions - "Soak Rise"
- Name - "Stop Slave"; Conditions - "Ramp To Idle"

As defined above, the master's Start Slave output will start the slave at the beginning of the Soak Rise State. If you want both sources to start depositing at the same time then you simply use the same soak and ramp power times (i.e. Rise to Soak Time, Soak Time, Rise to Predeposit Time and Predeposit Time) in both the master and slave controllers. If you want the slave to start depositing later than the master, you can simply use longer times or you can use a different state in the Start Slave condition to trigger the start signal.

Connecting the I/Os

Next step is to wire the master's output to the slave's inputs to complete the interface. If the slave has a passive I/O card then simply connect the each of the two output pins to each of the two input pins. If the slave has an active I/O card then you have to put one leg of an external 12 to 120 volt AC or DC power supply in series with the output and one input pin then connect the other leg of the supply to the other input pin. In either case, the input should go true when the output is true.

Alloy Composition

The final step is to program each 360 to get the desired alloy composition. To do this, you simply set each controller's rate so that the ratio between the two equals the desired alloy composition. For example, if you want the master's material to be 75% of the alloy then you set its rate at 3 times the slave's rate.

Multiple Co-deposit Materials

If you plan to co-deposit more than one material from the slave then you will have to add some addition inputs and outputs so the master can tell the slave which material to deposit. For example, say the master can deposit materials A&B and the slave C&D and you want to co-deposit combinations A&C and B&D.

Master Material Select Outputs

The first step is to create the outputs on the master that will tell the slave which material to run.

- Name - "Slave Material C"; Conditions - "Material A"
- Name - "Slave Material D"; Conditions - "Material B"

Slave Material Select Inputs

Next, create the slave's inputs and actions so the master's outputs can tell the slave which process to start.

- Name - "Select Material C"
- Name - "Select Material D"

Now link each input to an action by including it in the action's Condition string.

- Action Name - "Select Process 1"; Conditions - "Select Material C" (input)
- Action Name - "Select Process 2"; Condition - "Select Material D" (input)

Next, create a process #1 that consists of one layer using material C and a process #2 that consists of one layer using material D. The final step is to physically connect the new inputs and outputs as described above.

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