

Standard Operating Procedure of Atomic Absorption Spectrometer (ChemTech, Model CTA 3000)

1- OBJECTIVE

This document outlines the procedure for the operation of Atomic Absorption Spectrophotometer from ChemTech Company (Model CTA 3000).

2- SCOPE

Atomic absorption spectrometry (AAS) is a technique in which free gaseous atoms absorb electromagnetic radiation at a specific wavelength to produce a measurable signal. AAS is an important sensitive method that is suitable for the determination of selected elements at the trace and partly at the ultra-trace level.

3- RESPONSIBILITIES

It is the responsibility of researchers to follow the instructions of this procedure.

4- REFERENCES

Instruction Manual for ChemTech atomic absorption spectrometer.

5- DEFINITIONS

DI water: water that almost all of its mineral ions have been removed.

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6- PRECAUTIONS

- ✓ *Do not leave without closing the acetylene tank when not in use. Acetylene is explosive and quite dangerous.*
- ✓ *To shutoff the flame in an emergency- push the red button on the right-front of the instrument.*
- ✓ *The pressure of the acetylene gas cylinder must never fall below 4 bar.*
- ✓ *When the flame is ignited, to protect furnace, insert the steel plate which separate furnace from the flame.*
- ✓ *Water trap should be filled with water, so that excess amounts of water overflow to waste container.*

7- OPERATING PROCEDURE

- *Turn on the instrument (Power switch at right hand of instrument is only turned on when we wish to use furnace), computer and verify ventilation.*
- *Double click on the “AAWin” program located on the desktop.*
- *From drop down menu select the “online” item and press OK. The program will proceed through a checking process. Please wait until finishing the checking process. This usually takes a few minutes.*
- *Element selection window will appear. Select the working lamp and click on finish.*

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- *“AAWin” window will open. Open “instrument” menu and select “measure method” item. The “set measurement method” dialog box opens. Select the method you wish to use then click on Execute. Wait for the system to locate the selected atomizer in the path of light. This usually takes a few minutes. After finishing this procedure, close the “set measurement method” dialog box.*
- *Optimize atomizer position using “instrument” menu-Burner parameters. Position of the atomizer should be adjusted carefully so that the whole energy of hollow cathode lamp reaches the detector. The path of light can be checked by piece of white paper.*
- *After adjusting the position of the atomizer, click on “Lamp” icon and then click next. Press “search peak” button. The “wavelength scanning/peak searching” dialog box opens. Click “search peak” button and wait. This usually takes a few minutes. After appearing the spectrum, close the “wavelength scanning/peak searching” dialog box.*
- *Click on “Energy” icon. The “Energy” dialog box opens. Click on “Auto-balance”. Energy of the lamp should be about 100 %.*
- *Click on “Sample” icon and enter calibration and sample information.*

Above mentioned steps are identical for all measurement modes. Next steps for every measurement mode are explained in the following sections:

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7-1- Flame:

- *Switch on the air compressor, which is below the bench*
- *Open the acetylene gas valve.*
- *Click on “Fire” icon. The flame will ignite.*
- *Click on “Meas” icon. The measure window will be opened in the upper right corner of the screen.*
- *Place the suction tube in blank and click on the “Zero” button.*
- *Place the suction tube in your standard solution. Watch the Absorbance vs. time on the screen. When the Abs level has stabilized, click on the “start” button. If you are using multiple standards start with the least concentrated standard.*
- *The resulting calibration curve should be visible in the calibration window.*
- *Place the suction tube in DI water between standard solutions and samples.*
- *When analyses are complete, aspirate DI water for a few minutes.*
- *Finally, close the main acetylene tank valve and air supply valve.*

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7-2- Furnace:

- *Open “instrument” menu and select “Heating program” item. Define the heating program.*
- *Insert the graphite tube on its location on furnace (The hole of tube should be at the top). Check the path of light. Light should be passed through the graphite tube and reaches the detector.*
- *Open argon gas valve. Click on “tube” icon to fix furnace.*
- *Open the cooling water valve.*
- *Click on “burn” icon to cleaning graphite tube, if necessary.*
- *Click on “Meas” icon. The measure window will be opened in the upper right corner of the screen.*
- *Inject bank into graphite tube using micropipette and click on start to run heating program. When heating program finished, Click on the “Zero” button.*
- *Inject standard solutions into graphite tube using micropipette and click on start to run heating program.*
- *Once analyses are complete, close the main argon tank valve and the cooling water valve.*

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7-3- Hydride generation:

- *Insert quartz T-atomizer (quartz cell) on the burner head.*
- *Set up Hydride Vapor Generator (HVG-CTA 2290) and connect to quartz T-atomizer.*
- *Adjust the position of the atomizer.*
- *Connect the quartz cell to power supplier (Voltage = 120). Wait until heating the quartz cell.*
- *Open argon gas valve. Adjust the argon gas pressure to optimum. Most systems operate at 0.7 L/min. At 25 PSI, the flow is approximately 0.7 L/min.*
- *Click on “Meas” icon. The measure window will be opened in the upper right corner of the screen.*
- *Switch on Hydride Vapor Generator. Turn on both of the sample and drain pumps.*
- *Place the sample, acid and reducing agent pump tubing in corresponding solution. Watch the Absorbance vs. time on the screen. When the Abs level has stabilized, click on the “start” button.*
- *Place the suction tube in DI water between standard solutions and samples.*
- *Once analyses are complete, transfer all sample and reagent pump tubing to a DI water reservoir for rinsing.*
- *After the tubing has been flushed with DI water, remove the tubing from the rinse vessel and allow the system to pump dry for a minute before shutting off the pump.*

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- *To maximize the life of pump tubing, unclamp the tubing blocks and release the tension on the pump tubing after use.*

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