



Australian Government

MSL975010 Perform fire assay techniques

Release: 1

MSL975010 Perform fire assay techniques

Modification History

Release 1. Supersedes and is equivalent to MSL975010A Perform fire assay techniques

Application

This unit of competency covers the ability to safely extract a range of precious metals from their host matrices in readiness for analysis. The unit also covers the ability to select and/or modify laboratory methods to suit particular ores and to ensure total recovery.

This unit of competency is applicable to laboratory personnel working in the mineral assay industry sector.

While no specific licensing or certification requirements apply to this unit at the time of publication, laboratory operations are governed by relevant legislation, regulations and/or external accreditation requirements. Local requirements should be checked.

Pre-requisite Unit

MSL973011 Perform fire pouring techniques

OR

MSL954002 Prepare mineral samples for analysis

Competency Field

Testing

Unit Sector

Elements and Performance Criteria

Elements describe the essential outcomes.

Performance criteria describe the performance needed to demonstrate achievement of the element.

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|---|---|--|
| 1 | Classify ore samples and select fluxing method | <p>1.1 Review client request to identify sample/analysis requirements, preparation methods and equipment involved</p> <p>1.2 Inspect samples, compare with specifications, record and report any discrepancies</p> <p>1.3 Conduct visual and simple chemical tests to identify the type of sample and sulphide concentrations</p> <p>1.4 Review client sample/analysis history and identify possible chemical interferences</p> <p>1.5 Decide whether non-standard fluxing is required</p> <p>1.6 Select sample weight and flux to optimise precious metal recovery and purity</p> |
| 2 | Prepare for precious metal recovery | <p>2.1 Identify hazards and workplace safety procedures associated with the sample, preparation methods, reagents and equipment</p> <p>2.2 Examine the recommended preparation method to identify the critical steps that will affect the quality of analytical results</p> <p>2.3 Plan parallel work sequences to optimise the throughput of multiple sets of samples</p> <p>2.4 Assemble all required equipments, materials, reagents and check they are fit for purpose</p> |
| 3 | Recover precious metals from ore sample | <p>3.1 Weigh required amounts of sample and flux components to achieve an acceptable button and fluid slag</p> <p>3.2 Select the type and size of pot to suit sample method and client requirements</p> |

- 3.3 Mix charge to ensure homogeneity and optimal collection of precious metal
 - 3.4 Set and monitor furnace temperature/time to ensure complete fusion
 - 3.5 Separate slag and button with minimal loss of lead collector
 - 3.6 Maintain sequencing in order to track samples, buttons and prills throughout the recovery process
 - 3.7 Separate lead collector from the required precious metal and check for contamination, losses and evidence of other precious metals
 - 3.8 Minimise personal exposure to hazards and the release of collectors to the work environment
 - 3.9 Collate laboratory documentation and the prepared sample and present for analysis
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- 4 **Troubleshoot and correct failed recovery**
 - 4.1 Monitor all stages of recovery for indicators of potential loss
 - 4.2 Recognise undesirable recovery conditions and decide whether the process requires correction
 - 4.3 Choose an appropriate corrective action and re-start the process
 - 4.4 Document any adjustments made to standard methods and re-sequencing of samples
 - 4.5 Seek advice when problems are beyond scope of responsibility or knowledge
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- 5 **Perform daily maintenance of assay equipment**
 - 5.1 Segregate and dispose of waste in accordance with workplace requirements
 - 5.2 Grade and inspect pots using established criteria prior to storage for re-use
 - 5.3 Inspect furnaces for cracks, unserviceable components and remove slag

- 5.4 Inspect and clean extractive systems
- 5.5 Report defective equipment and consumable requirements to appropriate personnel

Foundation Skills

This section describes those language, literacy, numeracy and employment skills that are essential to performance.

Foundation skills essential to performance are explicit in the performance criteria of this unit of competency.

Range of Conditions

This field allows for different work environments and conditions that may affect performance. Essential operating conditions that may be present (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) are included.

Standards, codes, procedures and/or workplace requirements

Standards, codes, procedures and/or workplace requirements include the latest version of one or more of:

- Australian and international standards covering the requirements for the competence of testing and calibration laboratories; laboratory safety; quality and environmental management; analysis of specific ores and determination of gold; and labelling, storage, handling and transport of hazardous materials
- national work health and safety (WHS) standards and codes of practice, national environmental protection measures, and national measurement regulations and guidelines
- specific codes, guidelines and procedures, such as National Association of Testing Authorities (NATA) accreditation requirements, and principles of good laboratory practice (GLP)
- workplace documents, such as standard operating procedures (SOPs); quality and equipment manuals; maintenance schedules; material safety data sheets (MSDS) and safety procedures; material, production and product specifications; production and laboratory schedules; workplace recording and reporting procedures; and waste minimisation and safe disposal procedures
- recovery methods and procedures for specific samples, sites and clients (labelling, preparation, storage, transport and disposal), and published preparation methods

Samples

Samples include, but are not limited to, one or more of:

- solids, such as rocks, minerals, soils, sands and stream sediments
- core and other drill samples, such as rotary air blast (RAB), reverse circulation (RC) and aircore
- slurries, powder concentrates and metallurgical solutions
- dump samples and grab samples

Fluxes

Fluxes include, but are not limited to, one or more of:

- bulk fluxes containing PbO, borax, soda ash, silica, silver nitrate and flour
- non-standard flux additives such as:
 - flour (oxidising samples)
 - nitre (reducing samples, sulphides)

- silica (basic ores)
- PbO (siliceous ores)
- exotic additives, such as calcium fluoride (CaF₂) (refractory ores)
- nickel sulphide (NiS), nickel carbonate (NiCO₃), sulphur, borax and soda ash)

Sequencing of pots in a rack Sequencing of pots in a rack includes one or more of:

- addition of silver wire
- addition of coloured salts, such as copper (Cu)
- position of reagent blanks, standards and check samples

Collectors Collectors include one or more of:

- lead (Pb), nickel sulphide (NiS), bismuth (Bi) and tin (Sn)

Separation of collectors Separation of collectors include one or more of:

- cupellation
- digestion
- parting, annealing and weighing for a gravimetric finish

Waste Waste includes, but is not limited to, one or more of:

- rejected pots and cupels
- slag and furnace material
- disposable personal protective equipment

Hazards Hazards include, but are not limited to, or more of:

- dust, silica, slag, glass shards and molten flux
- chemicals, such as hydrofluoric acid, bromine, perchloric acid, aqua regia, cyanide, lead-based compounds, free-mercury and nickel compounds
- noise and vibration
- crushing, entanglement and cuts associated with moving machinery
- manual handling of hot/heavy loads, such as pots, racks and trolleys
- heat exhaustion/stress and fatigue

Workplace safety procedures

Workplace safety procedures include, but are not limited to, one or more of:

- ensuring access to service shut-off points, fire-extinguishers/fire hoses, safety showers/eye wash stations and a first aid station
- recognising and observing hazard warnings and safety signs
- labelling samples, reagents and hazardous materials
- using direct extraction and fume hoods
- providing guards for moving machinery parts
- providing noise insulation
- using personal protective equipment (PPE), such as dust masks, heat resistant mittens, safety face shields with tinted visor, coats, ear muffs, safety boots, heat-reflective clothing and latex gloves for flux handling
- following established manual handling procedures
- regularly cleaning equipment and work areas
- reporting abnormal emissions, discharges and airborne contaminants, such as noise, light, solids, liquids, water/wastewater, gasses, smoke, vapour, fumes, odour and particulates, to appropriate personnel

WHS and environmental management requirements

WHS and environmental management requirements include:

- complying with WHS and environmental management requirements at all times, which may be imposed through state/territory or federal legislation. These requirements must not be compromised at any time
- applying standard precautions relating to the potentially hazardous nature of samples

Unit Mapping Information

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Links

MSA Training Package Implementation Guides - <http://mskills.org.au/training-packages/info/>