TERM OF REFERENCE FOR RESEARCH PROJECT

TITLE OF THE PROJECT: Study for identification and validation of test method for analysis of Tungsten Concentrate ,Scheelite(CaWO4) and Wolframite [(Fe,Mn)WO4

1. **BACKGROUND:**

   1.1 Tungsten is a strategic metal for India as it is used extensively in high temperature applications and defence industries. Tungsten ores are mined and beneficiated to yield desired grade concentrate which is starting point for making other downstream/intermediate products like tungstic acid, tungsten metal powder, ferrotungsten, tungsten carbide, etc. The ores/concentrate specification for commercial purpose is in terms of WO3 (tungsten trioxide) content. Tungsten ores mining in the country at present is not substantial. Presently more than 95 percent of India's demand of tungsten is met by imports which mainly in form of tungsten concentrates.

   1.2 BIS has formulated Indian Standard IS 13751, titled as "Tungsten for hard metal Industry: Specification" which specifies the chemical composition of scheelite (CaWO4) and wolframite [(Fe,Mn)WO4] concentrate used in the hard metal industry. However no test method for testing chemical composition of scheelite (CaWO4) and wolframite [(Fe,Mn)WO4] concentrate is specified in IS 13751 as no Indian standard for testing is available.

   1.3 Testing method for chemical analysis at present is based on mutual agreement between purchaser and supplier.

   1.4 Therefore to bring uniformity and to standardize the test method a need was felt to conduct a study for identification and validation of test method for chemical analysis of scheelite (CaWO4) and wolframite [(Fe,Mn)WO4] concentrate.

   1.5 The standards mentioned above can be accessed from https://standardsbis.bsbedge.com/

2. **OBJECTIVE:**
   Study for identification and validation of test method for analysis of Tungsten Ores Concentrate, .Scheelite(CaWO4) and Wolframite [(Fe,Mn)WO4

3. **SCOPE:**

   3.1 Study the available literature like National / International/ association/industry standards available, research papers, any study conducted by other organizations/institutes on the subject and identify the various test methods used for chemical analysis of Tungsten Ores Concentrate, .Scheelite(CaWO4) and Wolframite [(Fe,Mn)WO4 .

   3.2 Identify the major tungsten concentrate users in the country.

3.3 Visit the major tungsten concentrate users, take data of the quantity being used by them, collect the test certificates received, the testing facilities available and test methods used by them.

3.4 Identify the laboratories testing tungsten concentrate and visit these laboratories and witness the test methods being used .

3.5 Based on literature survey, test methods used by manufactures and laboratories, propose a test method for testing Tungsten Concentrate ,Scheelite(CaWO4) and Wolframite [(Fe,Mn)WO4 with proper reasoning. Also validate the proposed test method.

3.6 Talk with the major importers of the Tungsten concentrate users and take data of the quantity of the product being imported and exported and also about the technical regulations of the countries where the product is being exported. Also take data from them for the method used for testing of tungsten concentrate.

3.7 Prepare a comprehensive project report of the data collected .

4. METHODOLOGY:

4.1 Study the literature and analyse the test methods for chemical analysis of Scheelite(CaWO4) and Wolframite [(Fe,Mn)WO4] : Tungsten Concentrate.

4.2 Visit the users of Tungsten Concentrate
  a) Collect the test certificates being received from the suppliers and test method mentioned in test certificate.
  b) Conduct focused group discussion with quality personnel involved   in testing of Tungsten concentrate.
  c) Make a list of test equipment's used.
  d) Test samples of Tungsten Concentrate through the proposed test method.

4.3 Visit laboratories and make report on
    a) test equipment required
    b) test method used
    c) testing charges
    d) testing time required
    e) sample size

4.4 Test the samples of known purity as per proposed test method in user laboratory/independent laboratory and validate the test method. Also calculate uncertainty of the test method.

4.5 Analyze the data and test reports and include the same in the project report.

5. SAMPLING PLAN

5.1 Two users each of Scheelite($CaWO_4$) and Wolframite [$(Fe,Mn)WO_4$] : Tungsten concentrate in large, small and micro scale shall be visited.

5.2 Two laboratories to be visited, preferably one from government sector and one from private sector.).

5.3 Eight samples of known purity of Scheelite($CaWO_4$) and Wolframite [$(Fe,Mn)WO_4$] concentrates drawn from user/trader/market shall be tested against proposed test method in two laboratories.

6. DELIVERABLES:

6.1 Final project report, in hard copy format as well as in soft copy (editable format), covering all aspects mentioned in the scope.

6.2 Questionnaire, discussion, visit reports, test reports to be appended with the final project report

7. TIMELINE:

The duration of the project is 4 months from the date of award of the project. The proposed indicative timeline stage-wise is given below:

Sr No	Stage	Time from date of award of project (cumulative)
1	Literature review, identify the various test methods used for chemical analysis of Tungsten Ores Concentrate, identity concentrate users , testing laboratories, traders	1 month
2	Visit to users ,Laboratories, traders, study the various test methods available, propose a test method to be followed to BIS, testing of samples as per proposed test method and validating the test method	3 month
3	Preparation and submission of first draft report to BIS	3.5 month
4	Submission of final project report	4 month

8. **Support from BIS will provide:**

    - National /international standards relevant to the project.

9. **Relevant sectional committee and Nodal officer from BIS**

    - **Sectional committee** MTD 34: Methods of Chemical Analysis of Metals Sectional Committee Sectional Committee
    - **Nodal officer :** Mr Ashish Prabhakar Wakle, Scientist C/ Deputy Director – Member Secretary MTD 34 ,email :mtd34@bis.gov.in   Mobile : 9503433445