Technology of Materials

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Subject: X-Ray Diffraction Analysis of an Apache Slag

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REPORT

INTRODUCTION

A sample of Apache slag fines was brought to the laboratory for X-ray diffraction analysis. Of special interest was the identification of possible crystalline silica phases. The following report represents the results of that study and is submitted respectfully.

SAMPLE PREPARATION & STUDY METHODS

As the material was received in powder form, no preparation was necessary other than packing it into a standard holder for study in a Philips Electronics X-ray diffractometer equipped with a crystal monochromator. The operating conditions are marked on the enclosed X-ray diffraction charts.

DISCUSSION

The X-ray diffraction chart enclosed is marked with the interplanar spacing measurement in angstrom units and with the corresponding Miller Index (hkl) of the crystallographic planes causing each reflection. Phase identification was made by comparison with standard data in the JCPDS/ASTM diffraction files.

The positions of most intense peaks for alpha-quartz, alpha-cristobalite and tridymite forms of silicon dioxide are marked. As can be seen, measurable amounts of these crystalline silicon forms are not present. The detection level for these forms is better than 1%.

The slag was found to be composed of three crystalline phases. The major component is the iron silicate mineral known as Fayalite, $2FeO.SiO_2$. A strong intermediate phase of a Dropside mineral, $CaO.MgO.2SiO_2$, is also present along with a lesser amount of the iron oxide mineral, Magnetite, Fe_3O_4. Except for a probable glass phase, which would not show up in the diffractometer study except in high concentrations, no significant amounts of other minerals are present.

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