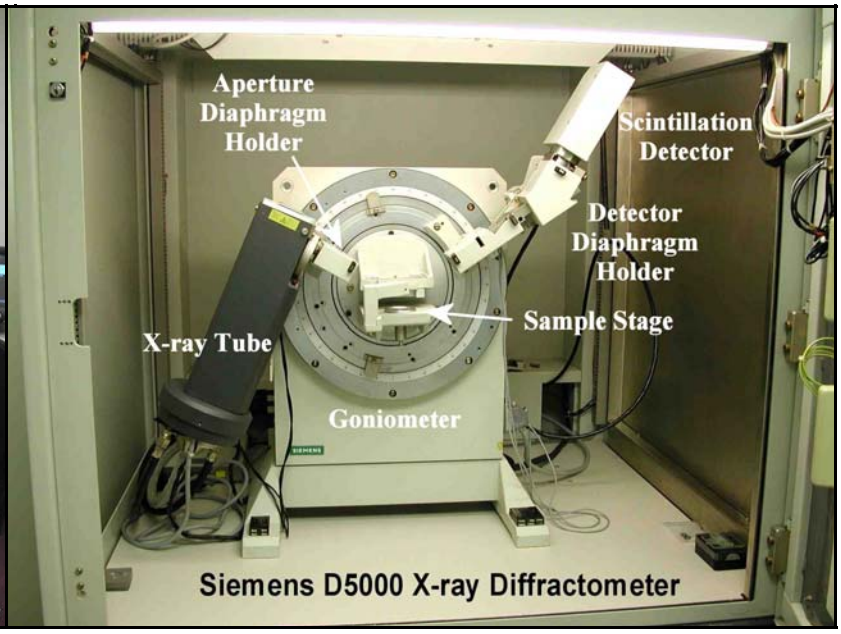
XRD Laboratory

CMC, Inc.

CMC's X-ray diffraction laboratory houses a state-of-the-art Siemens D5000 diffractometer with facilities for automated data acquisition and analysis (e.g., Siemens DIFFRAC AT, MDI's Datascan, Jade-7, Search/Match, Easy Quant, and ICPD's PDF-2 database softwares). The x-ray diffraction spectrum can be downloaded to a PC-based computer during the scan and can subsequently be analyzed by an integrated software having a powerful search engine that can detect various crystalline materials present in construction materials. X-ray diffraction is regularly used in examinations of efflorescence deposits, fill and subgrade materials, cementitious materials, shrinkage-compensating/patching/repair grout, concrete, mortar, stucco, aggregate, other project-specific fine-grained crystalline materials.

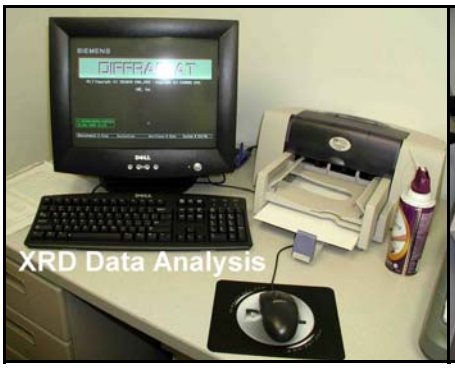

Siemens D5000 X-ray Diffractometer



For sample preparation, a small amount of a previously crushed bulk sample is pulverized in a bench top laboratory mill to a very fine power (first in Sepor Mini-Thor ring Mill to less than 45-µm size and then to 1 to 10-µm size by McCrone Micronizing Mill). Besides pulverized fine powder, polished and thin sections of concrete and other materials can also be examined by placing them in suitable sample holders in the x-ray diffractometer. A very small amount of sample can be analyzed by smearing on a sample holder containing a single-crystal quartz glass plate, or by using a thin-film sample holder. Other methods for analyzing fine samples are smearing the fine mineral powder on a normal petrographic slide and slurry it with acetone (which can led to preferred orientation of platy minerals), or, sprinkling powder onto a tacky adhesive coat on a glass slide (will provide less preferred orientation than the slurry with acetone). Clay samples are prepared by different methods.

Various selective extraction techniques of portland cement and clinker, such as potassium hydroxide/sugar extraction, salicylic acid/methanol extraction, and nitric acid/methanol extraction selectively dissolve the interstitial (aluminate, ferrite) phases, calcium silicate phases, and silicate/aluminate phases in the cement, respectively, which, thereby, reduce the peak interference problem, and highlight the selectively un-dissolved phases in the diffraction pattern.

Bulk samples are used for examination of cement, lime, gypsum, crushed/ground clinker, efflorescence deposits, mortar and concrete. In concrete, however, selective collection and pulverization of paste and mortar fraction from a crushed bulk concrete can enhance detection.


XRD Data Analysis