ABSTRACTS

This project takes Gibbs free energy in concrete as an important quantity governing those properties of concrete related to permeability and durability from a view of energy, which is one step further than the view of micro-pore-structure only.

A method for the determination of Gibbs, free energy through measurement of pore size distribution is worked out. The pF value and the pore size are derivable one from the other over some of the range, pF value can be determined by the average pore diameter.

The mercury intrusion porosimetry is employed as an experimental method to measure the pore size distribution. The investigation involves experiments on nineteen pairs of exposed concrete samples. The variables include grade of concrete, depth of concrete, and exposure conditions, etc.

Analysis is mainly based on the results of pore size distribution and the Gibbs free energy in pF value. It is found from the results that the value of Gibbs free energy in concrete is highly dependent on the grade of concrete, the water/cement ratio and the depth of concrete. Concrete of higher grade or concrete near moulded surface are found to have higher pF value, less effective porosity and/or smaller average pore diameter.

The importance and usefulness of the concept of Gibbs free energy in concrete in understanding and predicting practical problems are studied. The feasibility of using
Gibbs free energy in pF value as a fundamental parameter to indicate and compare the micro-pore-structure of concrete and its durability is discussed.