PRE-CONGRESS SPECIALISATION COURSES

COURSE TITLE:

ALKALI ACTIVATED ALUMINOSILICATE BINDERS

COURSE COORDINATORS:

J. Provis (Australia); e-mail: jprovis@unimelb.edu.au
A. Fernández-Jiménez (Spain); e-mail: anafj@ietcc.csic.es

CONTENT, TIMETABLE AND LECTURERS:

9:00-9:40 **Historical aspects, overview and key applications**
(J. Van Deventer)

History of alkali activation technology
Similarities and differences with Portland cement
Concrete mix design and engineering properties

9:45-10:25 **N-A-S-H gel. Descriptive model and nanostructure**
(A. Palomo)

Glukhovsky models
Timing of N-A-S-H formation - differences between alkali-activated slag and "geopolymer" systems
Davidovits' model (similar to zeolite synthesis)
Palomo (zeolite precursor)
Fernández-Jiménez (N-A-S-H gel, Gel1 and Gel2), etc....

10:30-11:10 **[C-S-H], -[C-A-S-H] and [N-A-S-H] gels. Synthesis, structure and compatibility studies**
(A. Fernández-Jiménez)

11:10-11:30 Coffee break

11:30-12:10 **Main factors in alkali-activation processes (I). Chemical and mineralogical composition of aluminosilicates**
(J. Provis)

Fly ash, metakaolin, clay, clay dehydroxylation, other materials
Covalent bonding in aluminosilicates/silicoaluminates
Polymerisation: a conceptual model
Availability of reactive silica
Availability of reactive aluminium
Effect of other minority elements: Fe, phosphates, sulfates, etc.

12:15-12:55 **Main factors in alkali-activation processes (II). Type and concentration of alkali activator**
(J. Provis)

Activation solution chemistry
Anion ffect: hydroxide, silicate, carbonate and sulfate
Cation effect: Na, K, Ca, Li, Cs…
Activator concentration and mixing
Solid alkali activator
Choosing the best activator for different solid precursors

13:00-13:40 **Main factors in alkali-activation processes (III). Curing conditions and exposure to high temperature**
(P. Krivenko)

Temperature
Time
Relative humidity
In situ strength during exposure to heat
Residual strength after exposure to fire
Thermal expansion
High temperature applications

13:40-15:00 Lunch

15:00-15:40 **Techniques to characterize aluminosilicate binder materials**
(J. Provis)

XRD, FTIR, NMR, SEM, BSEM, TEM
Synchrotron radiation and neutron beam-lines

15:45-16:25 **Durability**
(A. Fernández-Jiménez)

Acid attack (HCl, HNO_3, H_2SO_4…)
Sulphate attack, sea water attack
Carbonation
Corrosion
Alkali-silica reaction
Resistance to water
Wet/dry
Freeze/thaw

16:30-17:10 **Engineering properties and applications**
(A. Palomo)

Mechanical strength development
Matrix-steel bonding properties
Examples of application in the precast industry

17:15-18:00 **Progress in standardisation and commercialisation**
(L. Ko and E. Kavalerova)

Standards and regulations
Technological opportunities
Commercialisation

TOTAL LECTURES: 10 (40 min per lecture)