

# Higher Education and Research collaboration on Nanomaterials for Clean Energy Technologies (HRNCET) (2017-2021)



University of  
Jaffna



Western Norway  
University of  
Applied Sciences

Funded by

**Norwegian Partnership Programme for Global Academic Cooperation (NORPART)**

**Norwegian Centre for International Cooperation in Education SIU**

Organizing in collaboration with the Institution of Engineering Sri Lanka Northern Province Center and Kilinochchi Chapter

## Expert talk under HRNCET Project

### **Quantitative determination of calcium hydroxide in concrete by Near infrared spectroscopy**

**Alfred A. Christy, BSc (Pera), PhD (Bergen, Norway)**

*Professor of Chemistry, Dept. of Science, Faculty of Engineering and Science  
University of Agder, Kristiansand, Norway*

**Abstract of the talk:** Calcium hydroxide is one of the hydration products of Portland cement. The presence of calcium hydroxide and its high alkalinity in concrete helps in corrosion resistance in the embedded steel structures. Enough amount of calcium hydroxide is important for the passivity of the steel structures in concrete. A new method based on the first overtone of the OH stretching of the OH groups attached to calcium hydroxide that gives rise to an absorption at  $7082\text{ cm}^{-1}$  is used in the quantitative determination of calcium hydroxide in cement. Four concrete mixtures with different water / cement ratio were prepared in the laboratory and allowed to harden over 28 days. Small portions of the concrete samples were crushed, ground into fine powder and their NIR spectra were recorded using a Perkin Elmer an NIR spectrum one equipped with a transreflectance accessory. A total of 16 scans at a resolution of  $16\text{ cm}^{-1}$  were made on each sample. The 4<sup>th</sup> derivative profiles of the spectra were used in the quantitative analysis. A set of calibration standards were prepared by using calcium hydroxide and calcium silicate. Their absorptions at  $7082\text{ cm}^{-1}$  were determined by near infrared spectroscopy. A standard calibration plot was established between  $\text{Ca}(\text{OH})_2$  percentage in calcium silicate and the intensity of the NIR peak at  $7082\text{ cm}^{-1}$ . Calcium hydroxide in unknown concrete samples were quantified by using the calibration plot.

The results show that the amount of calcium hydroxide formed during hydration of the cement increases with the increase in water / cement ratio and reaches up to 15 % in the concrete.

**Venue** : Seminar Room, Administration Building, Faculty of Engineering, Ariviyal Nagar, Kilinochchi

**Date & time** : 11:00am on 21<sup>st</sup> March 2018

**Target group** : Industrial Engineers, Academics, Researchers, Postgraduate and Undergraduate Students

#### **Brief profile of Professor Alfred A. Christy**



Prof. Alfred A. Christy obtained a Bachelor's degree in Chemistry from the University of Peradeniya, and his masters and PhD from the University of Bergen, Bergen, Norway. The first position held by Professor Christy was as a Demonstrator/Assistant Lecturer in Chemistry at the University of Jaffna in Sri Lanka (1976-1977). After a six years contract appointment in Nigeria as senior Science master, he moved to Norway and started his postgraduate education while working as an assistant teacher in Chemistry at the Department of Chemistry, University of Bergen (1983-1990). After completing his postgraduate education, he joined the Department of Chemistry as a research Scientist (1991-1992) and later as a laboratory manager/research scientist in the FT-IR laboratory he built up at the department (1992-1998). He assumed a professorship in Chemistry at the Department of Chemistry, University of Agder in 1998.

Professor Christy has accumulated an impressive list of scientific achievements during his career. He has published over 100 papers in scientific journals and presented more than 110 lectures at conferences, institutions of higher learning and industrial establishments around the world. Professor Christy has authored several book chapters and reports. He co-authored a book entitled "Modern Fourier transform Infrared Spectroscopy" (A. A. Christy, Elsevier-2001). He has also been a co-editor of a second book "NIR spectroscopy in Food Science and Technology" (Wiley, 2006). Professor Christy has acted also as a referee for some 25 different International Journals across a wide spread of disciplines related to chemistry.

Professor Christy has been included in several biographical directories from 1991 onwards. He has also received several awards such as "Man of the Year 1994", "20<sup>th</sup> Century Achievement Award (1995)" and several other honours such as "Five hundred leaders of influence in the world".

Office of the HRNCET project, Department of Physics, University of Jaffna, JA 40 000, Sri Lanka

Telephone 0094 71 856 1715, E-mail : [hrcet@univ.jfn.ac.lk](mailto:hrcet@univ.jfn.ac.lk), Web: <http://project.jfn.ac.lk/hrcet/>