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2021 WORLD FUEL CELL CONFERENCE

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Name	Prof. Dr. Bruno G. Pollet AFIChemE FRSC
Affiliation	Norwegian University of Science and Technology (NTNU)

Invited Keynote Lecture

Presentation Title	Sonocatalysis – A "sound" process for producing hydrogen and catalytic materials for fuel cells and electrolyzers
Abstract (Approximately 200 words)	It is well accepted in the ultrasonic and sonochemistry (the application of ultrasound in chemistry) communities that ultrasonic waves propagating in liquids lead to acoustic cavitation, sonolysis (radical generation), areas of extreme mixing close to the ultrasonic source (transducer), degassing, surface cleaning (and erosion), and rises in bulk temperature. The publications of 'The use of ultrasound for the fabrication of fuel cell materials' (2010) and the 'Sonochemical and sonoelectrochemical production of hydrogen' (2019) triggered an international interest in the use of ultrasound, sonochemistry and sonoelectrochemistry (ultrasound combined with electrochemistry) for the synthesis of energy materials and useful gases. This is due to the fact that these methods are efficient and do not require intensive labour as well as the use of large amounts of toxic and environmentally hazardous solvents. This presentation highlights the development of novel electrolyzer and fuel cell catalysts and electrodes as well as the production of hydrogen by utilizing power ultrasound (20kHz–1MHz). It also highlights that care should be taken when ultrasonicating (in the form of a laboratory-grade ultrasonic bath, or an ultrasonic probe, sonifier) catalyst ink slurries prior to deposition for the fabrication of fuel cell and electrolyzer electrodes; as it has been shown that ultrasound leads to catalyst dissolution and ionomer degradation induced by acoustic cavitation.
Biographical Sketch (Approximately 200 words)	Bruno G. Pollet (Google Scholar h-index=42) is a full Professor of Renewable Energy at the Norwegian University of Science and Technology (NTNU), Leader of "NTNU Team Hydrogen" (the largest hydrogen R&D cluster in Norway), Extraordinary Professor in Hydrogen Energy at the University of the Western Cape (South Africa) and has been recently appointed as President of the Green Hydrogen Division of the International Association for Hydrogen Energy. His research covers a wide range of areas from the development of novel materials for low-temperature fuel cells and water electrolyzers, hydrogen production from (non-)pure waters, organics and bio-wastes, to fuel cell and electrolyzer systems, demonstrators and prototypes. He co-founded the Birmingham Centre for Hydrogen and Fuel Cell Research (UK) and was Director of HySA Systems Integration & Technology Validation Competence Centre (South Africa). He has worked for Johnson Matthey Fuel Cells Ltd (UK) and other various industries worldwide. He gained his PhD in Physical Chemistry in the field of Electrochemistry and Sonochemistry at Coventry University (UK) and undertook his PostDoc in Electrocatalysis at the Liverpool University Electrochemistry (UK). He serves on several associations and industry boards as well as editorial boards of international journals (Elsevier, Royal Society of Chemistry, Springer & Wiley).