I²CNER Webinar

International Institute for Carbon-Neutral Energy Research (WPI-I²CNER)
Kyushu University

Title **P-doping works well for fracture resistance in high strength steel: A case of elongated grain structure**

Speaker Prof. Kaneaki Tsuzaki
Emeritus Fellow of NIMS / Professor Emeritus of Kyushu University

Time& Date 1:00 PM (JST), Wednesday, June 18th, 2025

## Abstract

Phosphorus (P), a chemical constituent of steel in JIS standards, is treated as one of the harmful elements affecting low-temperature brittleness, weldability, cold workability and impact properties. Generally, the higher the P content, the more these properties are hampered, so the lower the P content, the better the quality. Thus, for example, the maximum P content in JIS-SCM440 steel is strictly specified as 0.030 wt.% for safety.

Here, we present our findings that, unlike these conventional perceptions, P acts as a beneficial element. If an ultrafine elongated grain structure is introduced by tempforming [1], the doping of P up to 0.093 wt.% significantly improves the impact toughness [2] as well as the delayed fracture resistance [3] in 1100 MPa class SCM440 steel. In the presentation, we will present our results in comparison with cases of normal tempered martensitic structure.

[1] https://doi.org/10.1016/j.jallcom.2011.12.123
[2] https://doi.org/10.1016/j.msea.2015.09.102
[3] https://doi.org/10.2355/isijinternational.ISIJINT-2024-189

## About the Speaker

Mr. Kaneaki Tsuzaki is a Professor Emeritus of Kyushu University and an Emeritus Fellow of NIMS. He has started his career of steel research in 1976 (49 years ago) when he became a senior of Department of Metal Science and Technology in Kyoto University. Completed doctoral course (1983), worked as a post-doctoral researcher at MIT (1983), an Assistant Professor at Kyoto University (1985), and an Associate Professor at Kyoto University (1991). Moved to the National Research Institute for Metals as a Unit Director (1997). Appointed Managing Director of the Structural Metals Center in NIMS (2006). Joined Kyushu University as a Professor of Mechanical Engineering Division (2013) and named Distinguished Professor in 2016. After retirement from Kyushu University, returned to NIMS (2020) and named NIMS Fellow (2021). He retired and was named NIMS Emeritus Fellow in April 2025.
He is still active and loves ‘Steel and Microstructure’ in research and education.

Registration https://zoom.us/webinar/register/WN_DqEHx443Sgu-fxmasy5i1Q

Host Prof. Toshihiro Tsuchiyama

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