Progress and Challenges Associated with Experimentation and Modeling of Corrosion in CCS Applications

Speaker

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Partecipation at the event is free, but registration is mandatory at this link

Carbon dioxide transport in pipelines is a critical component of **carbon capture and storage (CCS)** systems, which are crucial for mitigating climate change impacts by reducing atmospheric emissions of CO_2. There are operational challenges associated with the transportation of the captured gas from the source to wells where it is injected into the formation. CO_2 is normally transported in long carbon steel pipelines as a liquid or a supercritical fluid due to the favorable density. However, it likely contains impurities such as NO_X, SO_X, H_2S, O_2, etc. When water exceeds a solubility limit in the dense CO_2 phase and precipitates as a liquid, it can cause catastrophically **high internal corrosion** rates in the transportation lines, as it contains large amount of dissolved CO_2 which forms carbonic acid that attacks the carbon steel. Therefore, this scenario must be avoided to the maximum extent possible in operations, even if it must be accounted for as a worst-case scenario when upset conditions are encountered. The normal operating conditions are planned so that there is no liquid water present in the lines, yet the presence of other impurities, primarily NO_X, SO_X, may lead to formation of nitric and sulfuric acids, and their precipitation in the concentrated liquid form, what can again lead to catastrophic internal corrosion rates.

Research at the **Institute for Corrosion and Multiphase Technology at Ohio University** has been ongoing for over a decade addressing some of these problems. A current Joint Industry Project (JIP) is focused on thermodynamic and corrosion aspects of the problem. Experimental and modeling work is ongoing trying to predict the composition of dense phase CO_2, liquid water and strong acids that may precipitate in the lines. Investigation of corrosion mechanisms and rates under such conditions is the ultimate goal of the JIP, aiming at helping the industry design and operate carbon steel pipelines transporting CO_2 in a safer and more efficient way.

Dr. Srdjan Nesic is an Ohio University Distinguished Professor and a Russ Professor of Chemical Engineering at the Department of Chemical and Biomolecular Engineering in Athens, OH, USA.

Since 2002 he also serves as the Director of the Institute for Corrosion and Multiphase Flow Technology at the same university, which is one of the world's largest research institutions of the kind.

Dr. Nesic has published extensively in the field of corrosion, including 18 articles in books, 160+ peer reviewed journal papers, conference papers and scientific reports in the field of corrosion with applications in the oil and gas industry.

He serves as Associate Editor at the CORROSION journal published by NACE/AMPP, as well as at the Corrosion Science Journal published by Elsevier.

Dr. Nesic is the recipient of numerous awards and honors such as: fellow of the Chinese Society for Corrosion and Protection (CSCP), Beijing (China) in 2024, Willis Rodney Whitney Award by NACE in 2018, the Best Paper award in the CORROSION journal for 2010 and 2015, H.H. Uhlig Award given in recognition of outstanding effectiveness in post-secondary corrosion education from NACE in 2007 and Bengough award in 1998.

He has chaired many sessions at international conferences and has delivered numerous keynote and plenary lectures.

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