Hydrogen Permeation Studies
ASTM G 148
Hydrogen Embrittlement Sensor for Pipelines
AMPP Certified Corrosion Engineers and Failure Analysts

Team Matergenics has a rich history of expertise in the field of hydrogen permeation, backed by two decades of experience. We have harnessed our knowledge and state-of-the-art equipment, consisting of three permeation cells, to conduct numerous hydrogen permeation tests following the ASTM G148 standards. Over the years, our dedicated team has not only accumulated extensive data but also developed the capability to provide comprehensive insights into hydrogen permeation phenomena.

Our offerings encompass a wide range of services, including the provision of permeation plots, diffusion coefficient values, and precise hydrogen trapping calculations. These invaluable resources allow us to offer a deep understanding of how hydrogen behaves within various materials and structures.

Furthermore, we have expanded our capabilities to include the modeling and execution of Hydrogen Embrittlement assessments. This critical assessment helps identify the susceptibility of materials to hydrogen-induced embrittlement, a vital factor in ensuring the integrity and safety of pipelines and other infrastructure.

As part of our commitment to advancing safety in the industry, we are currently in the process of developing a cutting-edge Hydrogen Embrittlement sensor. This sensor is designed to provide real-time, on-site data and information regarding the risk of Hydrogen Embrittlement in pipelines. By delivering timely and accurate data, our sensor will empower companies to proactively address potential HE issues and enhance the overall safety and reliability of their systems.

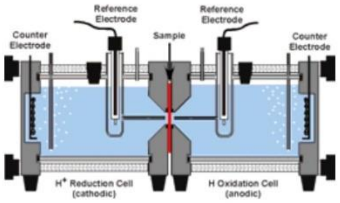
At Team Matergenics, we are dedicated to staying at the forefront of technology and innovation in the field of hydrogen permeation and embrittlement. Our mission is to contribute to safer and more efficient operations in industries where hydrogen-related challenges are prevalent.

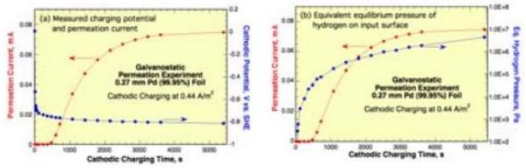
II. Diffusion and Solubility Measurements

Electrochemical methods can be used to measure:

1) hydrogen diffusion rates
2) hydrogen solubility
3) hydrogen absorption from service environments
4) the influence of metallurgical variables on these factors

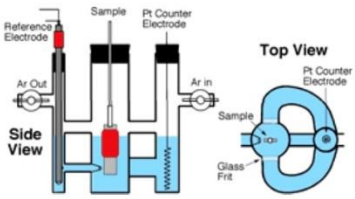
A. Electrochemical Permeation - Devanathan and Stachurski (1962) and ASTM G148

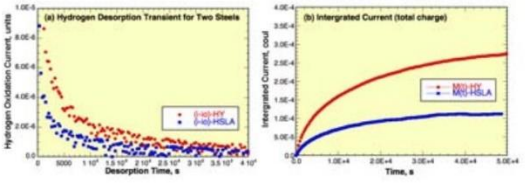




Constant current charging produces a constantly increasing hydrogen fugacity.

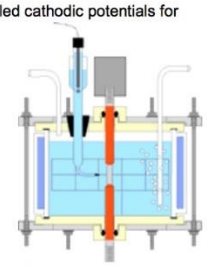
B. Electrochemical Absorption/Desorption



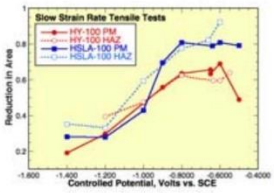


III. Mechanical Properties

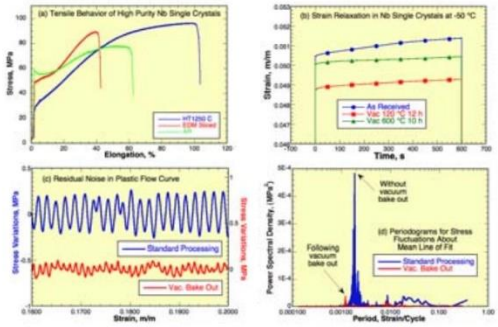
A. Slow Strain Rate Tensile Tests - Controlled cathodic potentials for varying hydrogen activity



B. Hypothesis Testing - Guiding R&D into variables such as composition, microstructure, and heat treatments



C. Advanced Analytical Methods - Understanding interactions



IV. Conclusion

Electrochemical reactions are a convenient method for introducing hydrogen into metals for studying hydrogen embrittlement, testing hypotheses, or guiding innovation. In addition, electrochemistry can be used to directly control or measure hydrogen activity (potential) or flux (current) in these studies.