

HYDROGEN BARRIER COATINGS AND LINERS FOR STEEL PIPELINES

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Repurposing existing natural gas pipelines is a cost-effective solution for transporting hydrogen either in the form of a blend of natural gas and hydrogen or in pure form. However, some pipeline steels in use may be susceptible to hydrogen embrittlement and can pose integrity risks in hydrogen service. These risks can be dealt partially with integrity management strategies. But in some cases, hydrogen embrittlement mitigation technologies will need to be developed and employed. One mitigation strategy is to isolate the interior surface of pipeline from high-pressure hydrogen containing gases. To accomplish this, National Energy Technology Laboratory (NETL) is developing hydrogen barriers in the form of coatings and liners. Zinc-based metallic coatings with extremely low hydrogen permeability are deposited on the interior surface of steel pipelines using cold spray technology. Chemical composition of the metallic coatings is optimized to provide corrosion resistance with self-healing properties. Another technology developed at NETL is a liner that is made of a multilayer material. A continuous metallic foil layer sandwiched between polymer layers constitutes a barrier for hydrogen inside the liner. The liner is installed in the pipeline by pulling the liner into a long segment of the pipeline from an access point. In this presentation, both the coating and liner technologies will be demonstrated as hydrogen barriers using high-pressure gas permeation tests.