ADVANCED NATURAL GAS PIPELINE MATERIALS

NETL

NATIONAL ENERGY TECHNOLOGY LABORATORY

NETL's Natural Gas Pipeline Materials Program focuses on developing low-cost, durable, advanced liners and coatings that will protect steel transmission pipelines from internal corrosion. This will strengthen the reliability, public safety, operational efficiency, and flexibility of the nation's natural gas infrastructure pipelines.

Liner and coating materials of interest are those that can block the permeation of corrosive species to the steel surface.

Key focus areas of the program's research are:

- Polymer-Metal-Polymer Composite Barrier Liners
- Joining Methodologies for Composite Liners
- Metallic Coatings
- Multi-layer Polymer Coatings

Albany, OR • Anchorage, AK • Houston, TX • Morgantown, WV • Pittsburgh, PA

U.S. DEPARTMENT OF ENERGY | NATIONAL ENERGY TECHNOLOGY LABORATORY

R&D226, December 2020

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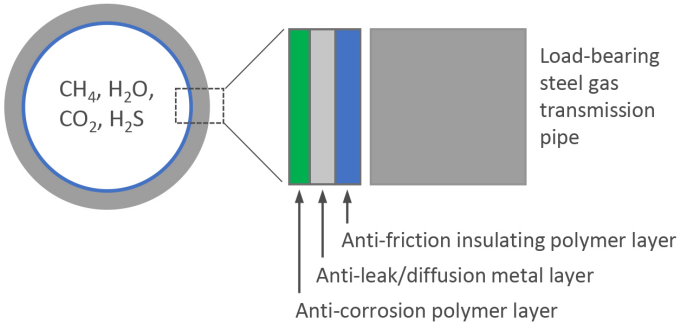
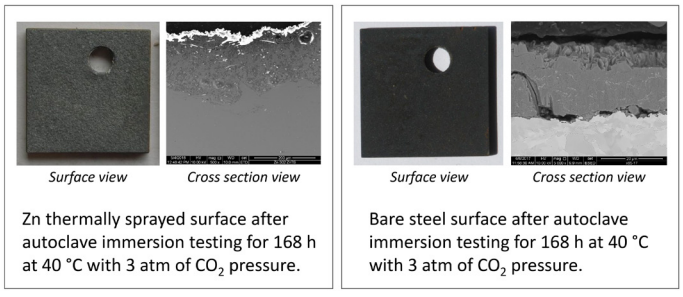
Polymer-Metal-Polymer Composite Barrier Liners — focuses on developing liners consisting of three layers. The first layer, which is in contact with the bare pipeline steel, will have anti-friction and insulating properties. This layer will be made of a polymer. The second layer will be made of corrosion-resistant metal thin foils. The third polymer-based layer, which is in contact with the natural gas environment, will have anti-diffusion, anti-corrosion properties. Joining methodologies are being investigated to overcome the challenge of joining metallic thin foils in a defect-free and continuous manner.



Gas permeation reduction with metal-composite barrier liners.

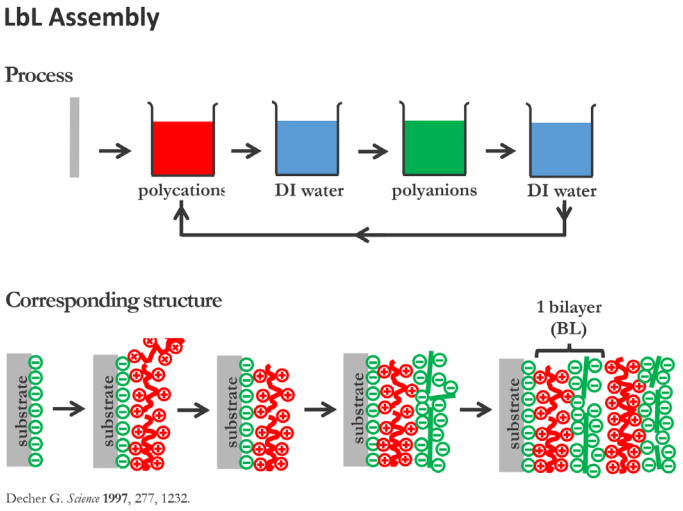
Joining Methodologies for Composite Liners — focuses on investigation of a viable joining technology for a metal foil layer of composite liners.

Metallic Coatings — focuses on developing sacrificial anodic coatings that will protect the steel pipeline from corrosion by corroding itself and then forming a protective passive film.



Zn coatings deposition of protective Zn carbonate.

Multi-layer Polymer Coatings — focuses on developing an advanced fluidic assisted layer-by-layer polymer coatings containing environmentally friendly corrosion inhibitors.



In a typical layer-by-layer (LbL) assembly process, positively and negatively charged components are alternately deposited to produce layered composite membranes.

IMPACTS

Advanced natural gas pipeline materials research has the following impacts on reliable operations of natural gas transmission pipelines:

- Helps strengthen public safety and operational efficiency.
- Provides effective methods for corrosion protection of the nation's aging and new natural gas infrastructure pipelines.
- Reduces natural gas leakage through cracks and holes caused by corrosion.

The safety of our citizens and their property is our number one priority, and our new initiatives are designed to enhance that safety. By fine-tuning the composition, molecular interaction, and structure of layer-by-layer assemblies, NETL is developing multilayer barrier coatings that can remain chemically stable under the most challenging environmental conditions.

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