Multi-Compound Green Corrosion Inhibitor for Gas Pipeline: Synthesis, Optimization, and Evaluation

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Main Objectives and Goals

- Engineer sustainable inhibitors from renewable feedstocks.
- Perform AI-based simulation for optimal inhibitor deployment.
- Establish evaluation metrics and implement maintenance optimization.
- Validate the proficiency guided by technical advisory panel.

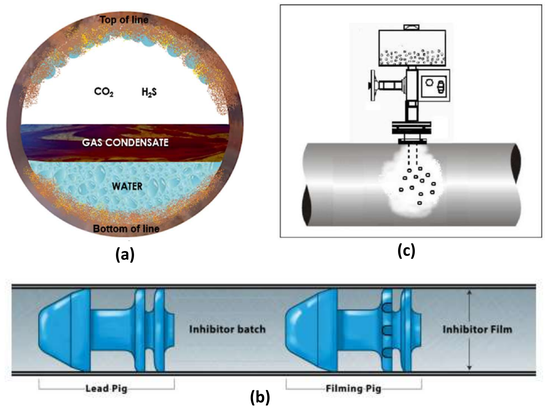

Figure 1: (a) Illustration of BOL and TOL corrosions; (b) batch and (c) continuous applications of inhibitor [1].

Figure 2. Green corrosion inhibitor.

Project Approach/Scope

- Design and Synthesis of Multi-compound Green Inhibitors;
- Simulation-based Inhibitor Implementation Optimization in Gas Pipelines;
- Inhibitor evaluation and maintenance scheduling based on inspection.

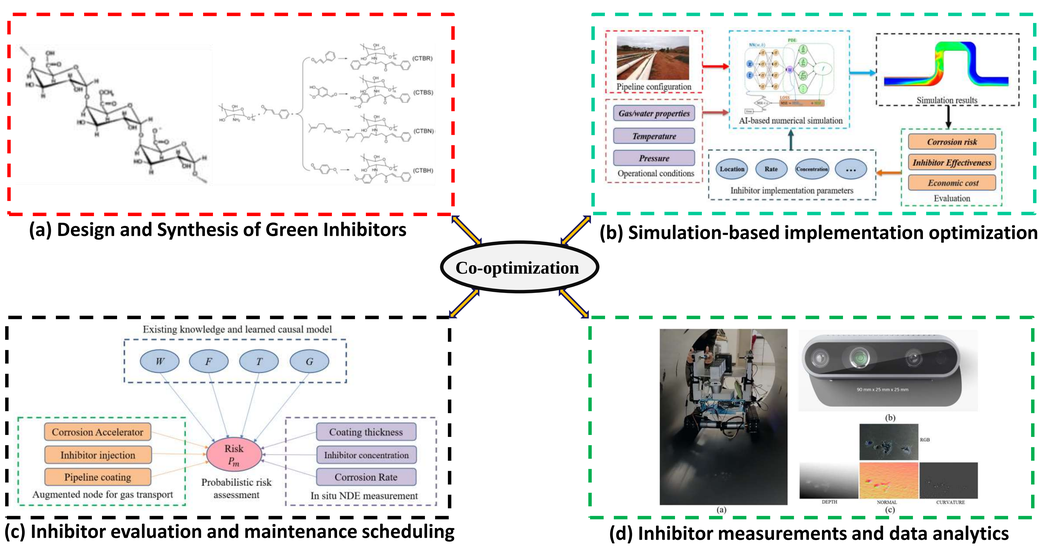

Figure 3. Schematic illustration of the co-optimization of proposed tasks [2].

Expected Results or Results to Date

- We anticipate that the combined efficacy of multi-compound green inhibitors will be validated in real-world condition.
- AI-based simulations are expected to reveal the performance of the inhibitor under various operational scenarios.
- The outcomes will also provide guidance on further improvements of the inhibitors as per the recommendations of the technical advisory panel.

Table 1. Examples of bio-based corrosion inhibitors to be investigated in this project [3].

Plant or Source	Active Constituent	Solvent & extraction method	Metal to Protect	Corrosive Environment	Corrosion Inhibition Efficiency (%)	Inhibitor Concentration
Citrus peel	Pectin	HCl and ethanol	Mild steel	1M HCl	94.2 at 45 °C	2 g L^{-1}
Shrimps shell waste	Chitosan	NaOH	Carbon steel	1M HCl	88.5 at 25 °C	10^{-3} M
Plantago ovata	Polysaccharide (galaturonic acid)	Water	A1020 carbon steel	1M HCl	94.4 at 45 °C	1 g L^{-1}
Rhododendron schlippenbachii	Polyphenolic compounds	Methanol	Low carbon steel	1M H_2SO_4	94.2 at 30 °C	600 ppm

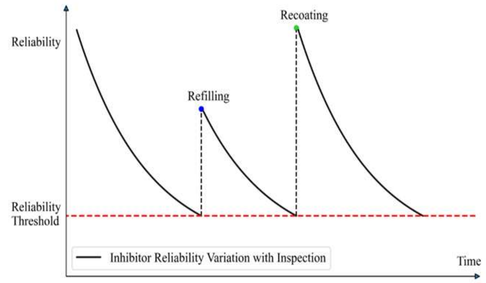

Figure 4. Schematics for time-dependent inhibitor reliability with maintenance.

Acknowledgments

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References

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