

All-in-One Multifunctional Cured-In-Place Structural Liner for Rehabilitating of Aging Cast Iron Pipelines

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Main Objective

This project was awarded to “North Dakota State University” to develop and test the feasibility of an all-in-one, multifunctional, high-performance cured-in-place pipe (CIPP) structural liner that is self-healing and self-sensing. Targeting to improve the sustainability and reliability of CIPP technologies in practice for better mitigating risks of the repaired aging cast iron pipelines.

All-in-One Multifunctional CIPP Structural Liner

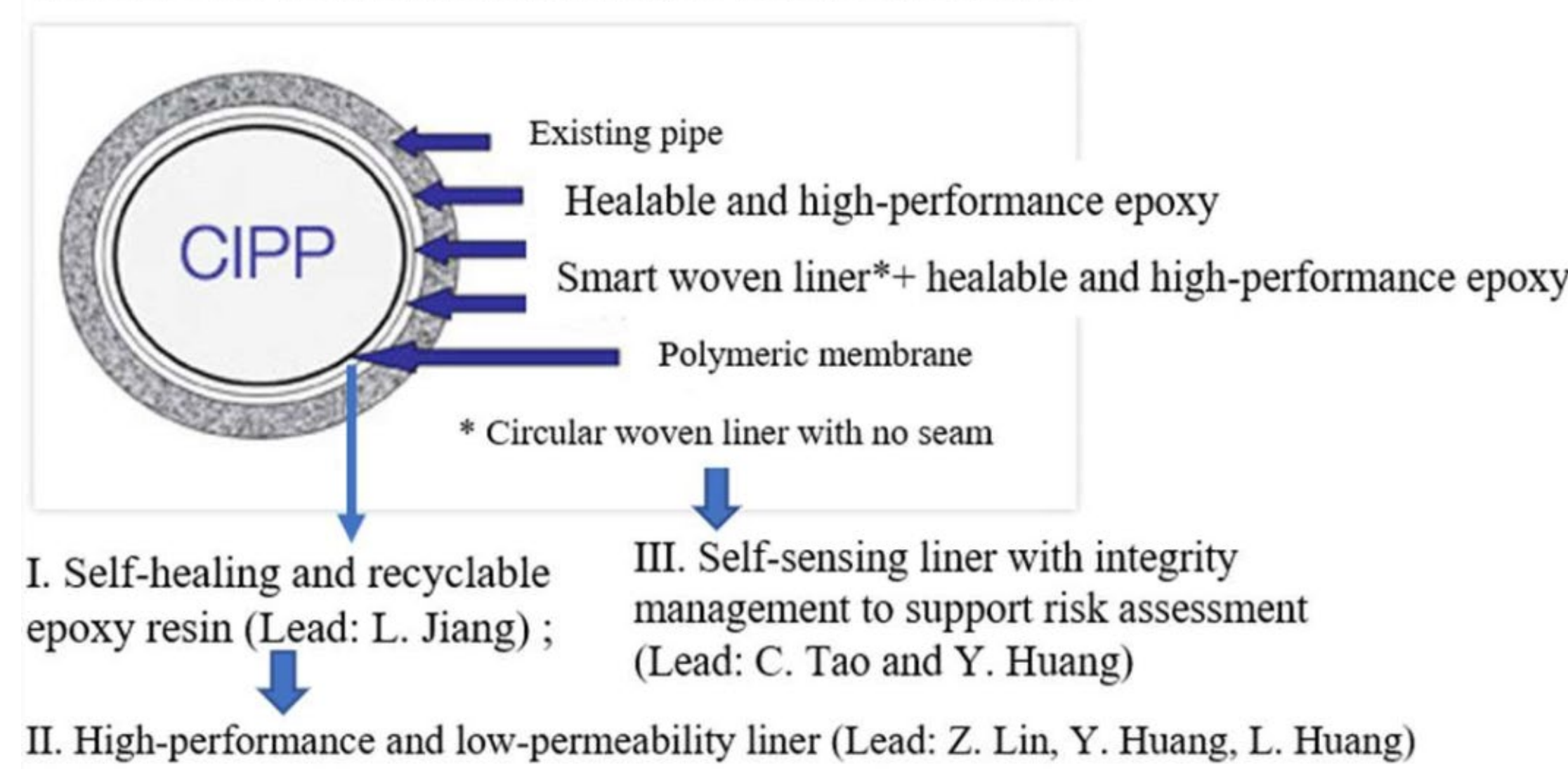


Figure 1. Illustration of the proposed all-in-one CIPP liner.

Project Approach

The proposed study for all-in-one liner development comprises:

Experimental study (A):

- Distributed fiber optic sensors
- Fiber fabric reinforcement
- Nanoparticles reinforcement
- Self-healing polymers

Numerical analysis:

- Finite element numerical analysis (B)
- Molecular dynamics simulations on permeability & interfacial bonding chemical analysis (C)
- AI-driven risk analysis for integrity management (D)

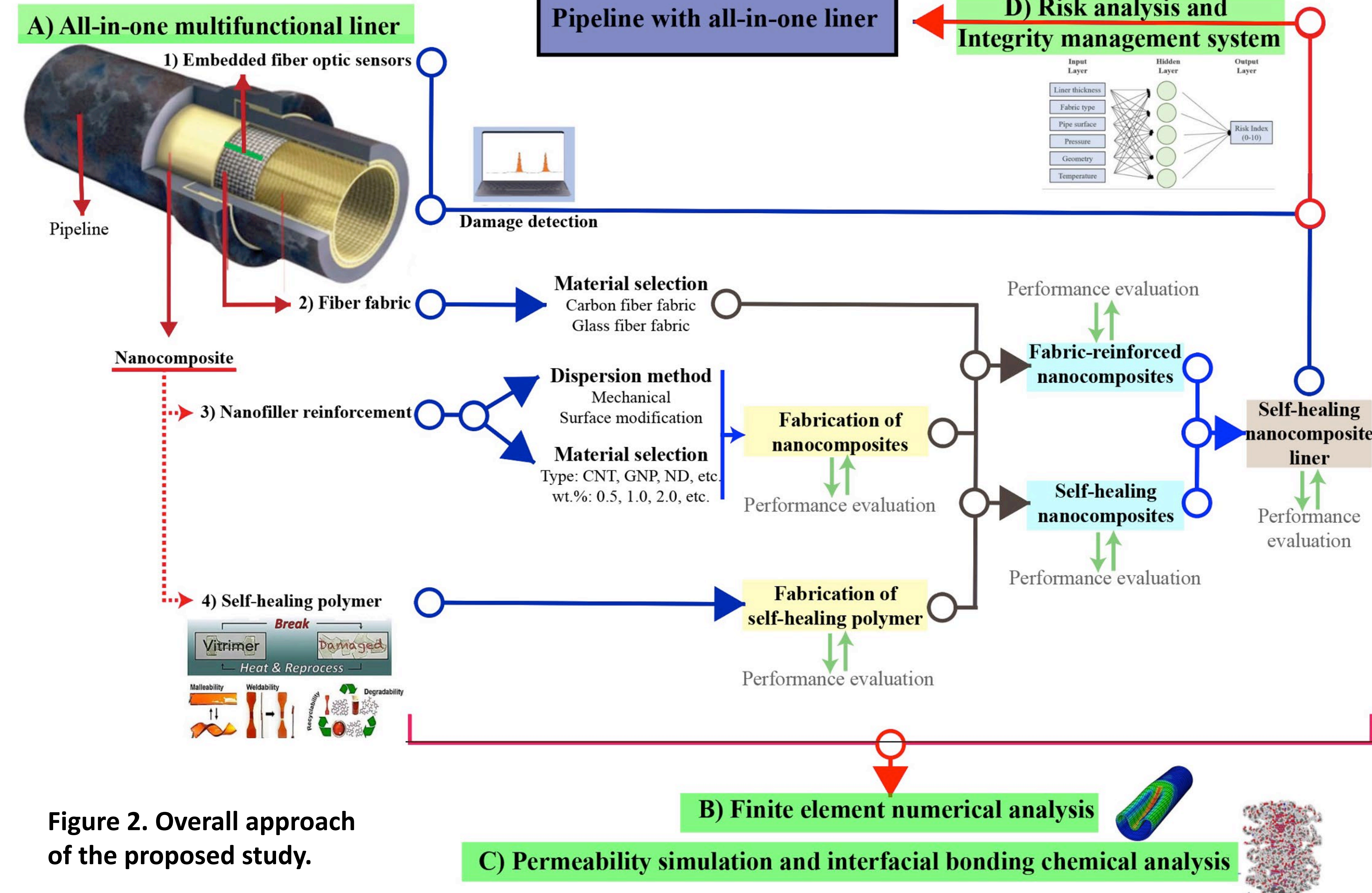
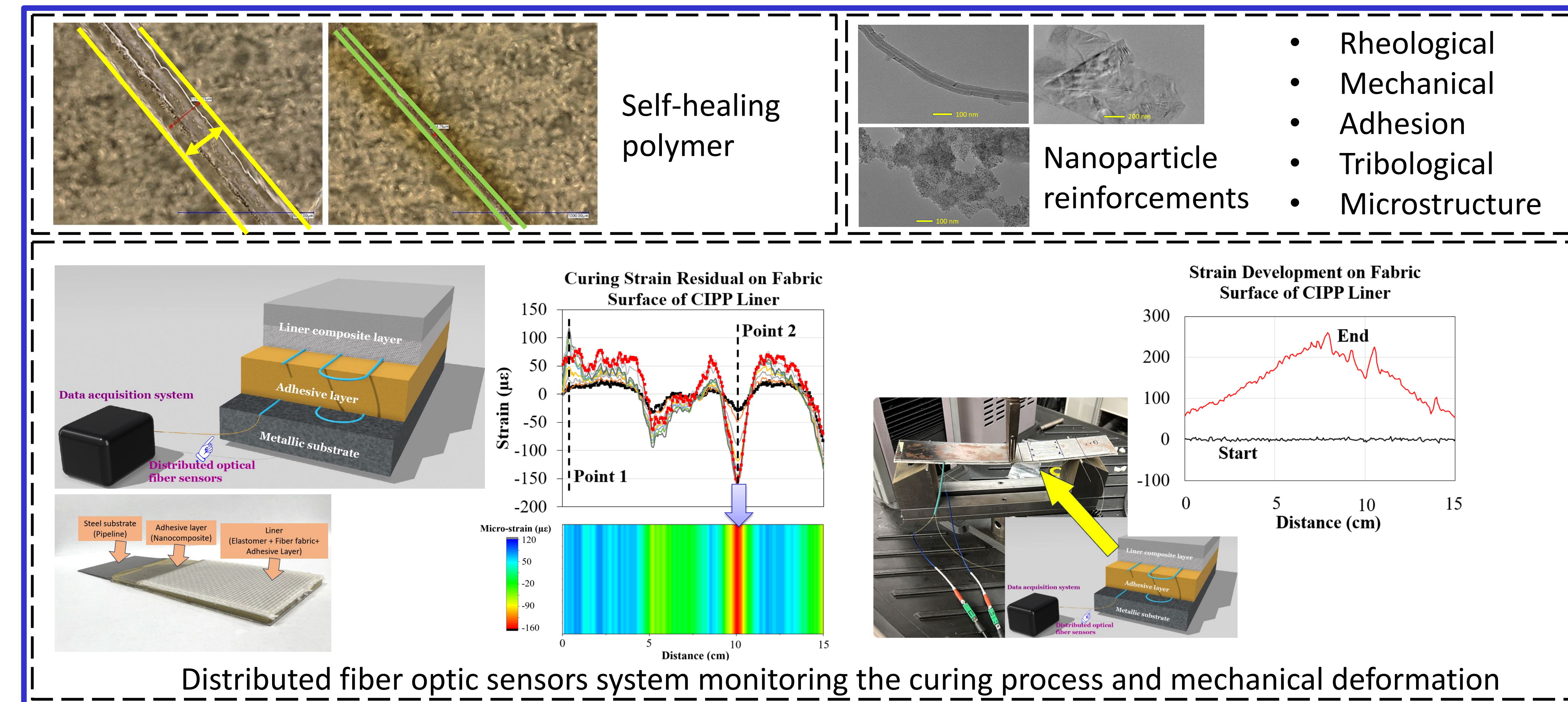


Figure 2. Overall approach of the proposed study.

Results to Date

The current results and findings are presented below, illustrated by data from the experimental study (blue box) and numerical analysis (red box).



Distributed fiber optic sensors system monitoring the curing process and mechanical deformation

Figure 3. Results from experimental study.

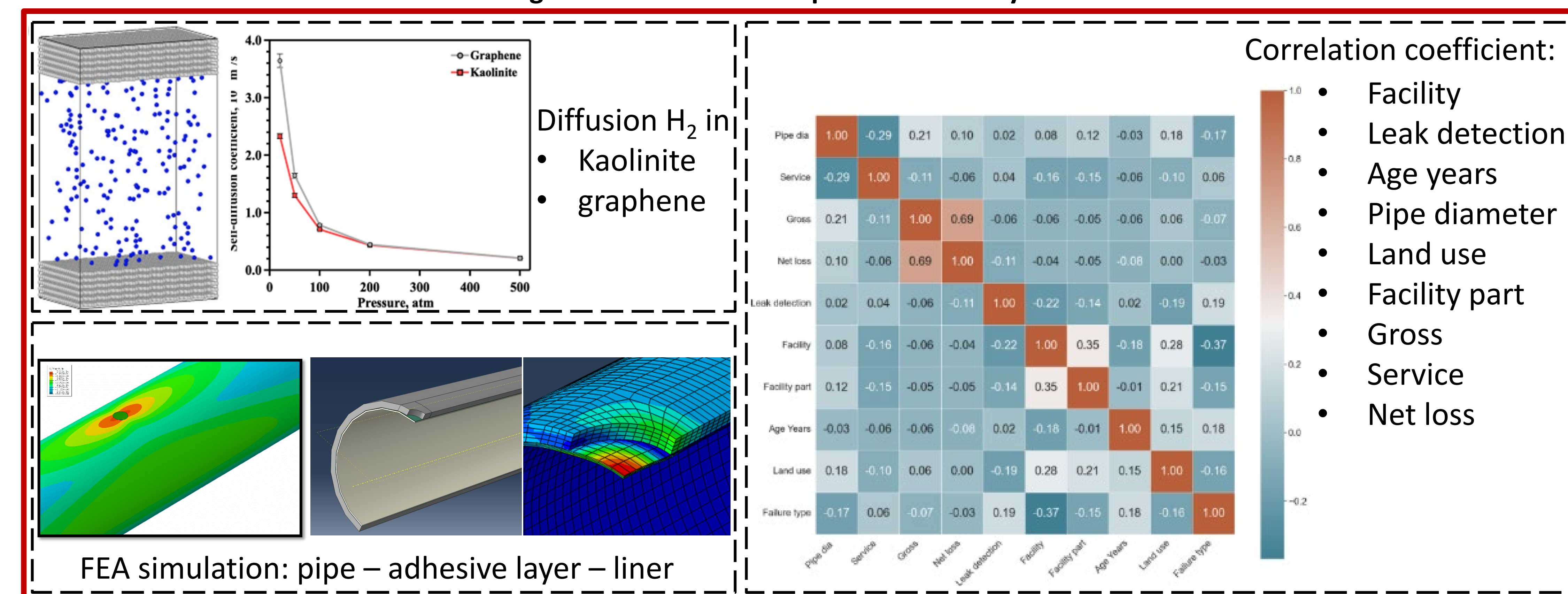


Figure 4. Findings from numerical analysis study.

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Public Project Page

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