Effect of *Pseudomonas Aeruginosa* on Corrosion of C1018 Carbon Steel under the Influence of T-Consciousness Fields

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Abstract

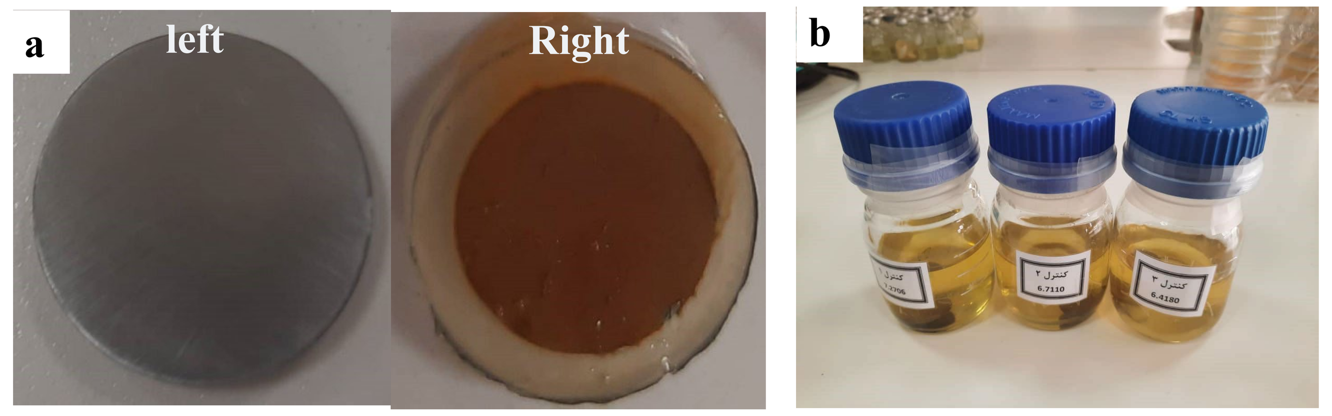
This study explores the impact of T-Consciousness Fields (TCFs) on C1018 carbon steel corrosion by *Pseudomonas Aeruginosa*. Two types of TCFs were applied to bacteria and steel coupons separately. Although no significant changes in corrosion were observed, altered behavior suggests a connection between TCF application and outcomes. Specifically, corrosion increased with TCF1 on coupons but not on bacteria. The bacterial growth inducer decreased coupon weight, and TCF2 treatment countered a slight corrosion increase under tension. Further research is needed to understand their effects fully.

Introduction

- ❑ The concept of T-Consciousness, introduced by Mohammad Ali Taheri in the 1980s, posits it as a fundamental element of the universe, giving rise to information, matter, and energy. Taheri proposed various T-consciousness fields (TCFs), each serving distinct functions. According to Taheri's theory, exposure to TCFs can induce behavioral changes in samples by imparting information.
- ❑ Corrosion, including microbial corrosion accelerated by biofilms like those produced by *Pseudomonas Aeruginosa*, presents significant economic and environmental challenges, with costs surpassing $90 billion annually. These biofilms, created by microorganisms, notably impact iron due to their metabolic activities, posing threats to infrastructure integrity.
- ❑ This study aims to determine the effectiveness of TCF1 and TCF2 on iron's biocorrosion process (microbial).
- ❑ TCF's impact on bacterial biofilms is unexplored; the measure of steel corrosion within the biofilm system is analyzed as the output.

Materials and Methods

- ❑ Bacterial Culture: Preparing *P. aeruginosa* culture in LB medium with KNO_3, pH adjusted to 7.0, autoclaved, each container with 100 ml.
- ❑ Preparing C1018 steel coupons: Disk-shaped coupons cut from steel rod (low-carbon, body hardening quality), top surface area 3 cm^2 exposed, coated with polytetrafluoroethylene (PTFE) for corrosion protection.



(a) Uncoated (right) and coated (left) C1018 steel coupons.
(b) Containers with culture medium, bacteria, and steel coupons.

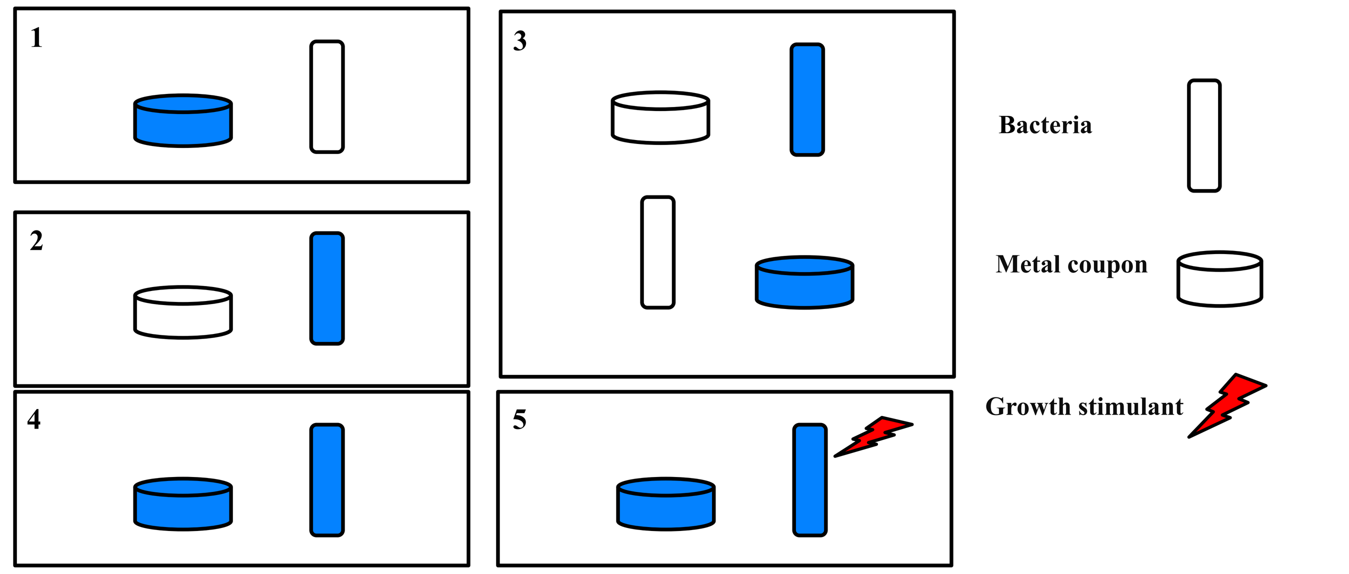
Laboratory Procedures

This entire experiment was conducted using a double-blind method, with lab technicians unaware of TCF theory and the individual applying the treatment unaware of the study's details.

- Investigated biocorrosion induced by *P. aeruginosa* biofilm on C1018 stainless steel over 72 hours.
- Assessed metal weight loss as a measure of corrosion.
- Cultured bacteria and metal coupons for 3 days to promote growth.
- Conducted treatments with TCF under various conditions, including with bacteria and metal coupons, both together (system treatment) and under growth stress.
- Analyzed corrosion results through statistical analysis.
- Employed traditional analysis methods and plotted daily 24-hour data.

Analyzing TCF treatments with different conditions

1) Treatment of metal coupons (non-biological component).
2) Treatment of bacteria (biological component).
3) Combination of data from metal coupons and bacteria (Mixed condition).
4) Simultaneous treatment of both components (Simultaneous Base condition).
5) Simultaneous treatment of both components under growth stress (Simultaneous Under Stress condition).
6) Blue signifies TCF treatment in each condition; growth stress indicated by symbol.



TCF treatment condition types

Data Analysis

- ❑ **Weight Loss Measurement**
  - Metal coupons' initial and final weights measured after testing and surface coating removal.
  - The difference showed weight loss from microbial corrosion.
- ❑ **Statistical Analysis**
  - The values were expressed as mean ± standard error, and analyses were repeated at least three times.
  - Then one-way ANOVA analysis followed by multiple comparisons with 95% confidence intervals was performed, and significant values less than 0.05 ($p < 0.05$) were presented.

Results

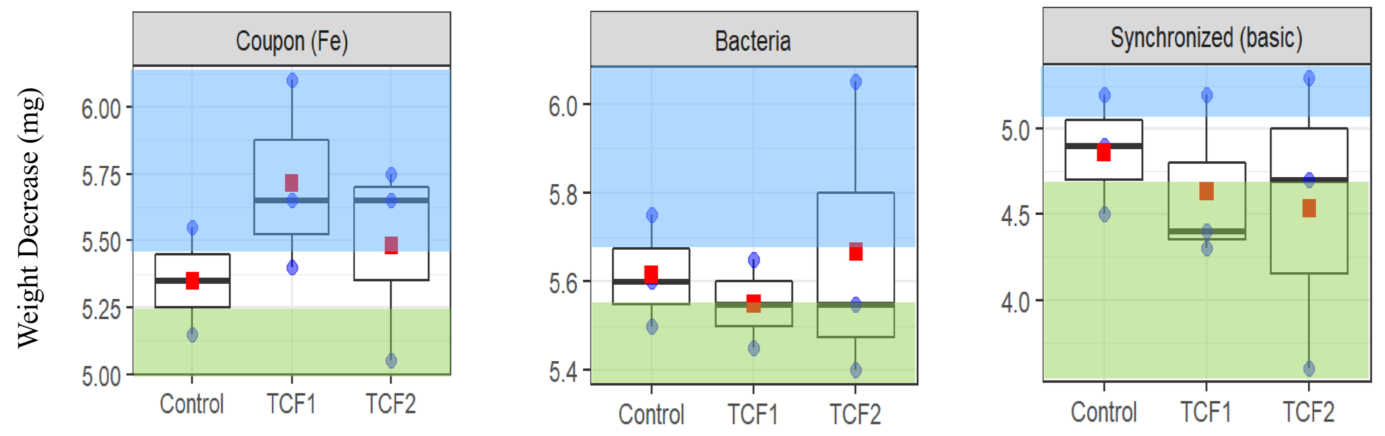
Weight loss values for samples and controls under different conditions.

	Treated/Treatment	Control	TCF1	TCF2
1	Fe coupon	5.35±0.12	5.72±0.35	5.48±0.38
2	Bacteria	5.62±0.13	5.55±0.10	5.67±0.34
3	Mixed (Fe coupon +Bacteria)	5.48±0.21	5.63±0.25	5.58±0.34
4	Synchronized (Fe coupon and Bacteria): Basic	4.87±0.35	4.63±0.49	4.53±0.86
5	Synchronized (Fe coupon and Bacteria): under bacterial growth tension	6.67±0.75	7.07±0.15	6.47±0.91

Comparison of steel coupon weight loss percentage in different treatments.

Difference with Synchronized (Basic)	Relative to	Control	TCF1	TCF2
Fe coupon	Same sample	9.93	23.38	20.96
	Control	9.93	17.47	12.67
Bacteria	Same sample	15.41	19.78	25.00
	Control	15.41	14.04	16.44
Mixed	Same sample	12.67	**21.58**	**22.98**
	Control	12.67	15.75	14.55
Synchronized (under bacterial growth tension)	Same sample	**36.99**	**52.52**	**42.65**
	Control	**36.99**	**45.21**	32.88

1. **Evaluation of separate and simultaneous treatment of system components**



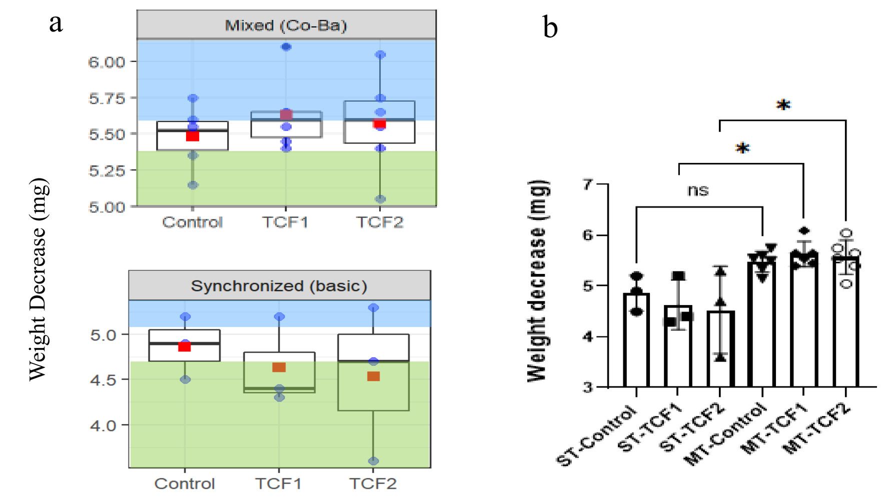
Corrosion distribution induction (Blue box) and inhibition (Green box) in treatment samples compared to controls.

Anova-test revealed no statistically significant variation among 3 treatment types.

- ❑ Box plots show inhibition trends in simultaneous treatment.
- ❑ Significant inverse correlation noted between control data and TCF1 treatments.
- ❑ TCF1 predominant in metal coupon treatment, TCF2 induces corrosion in bacterial treatment.

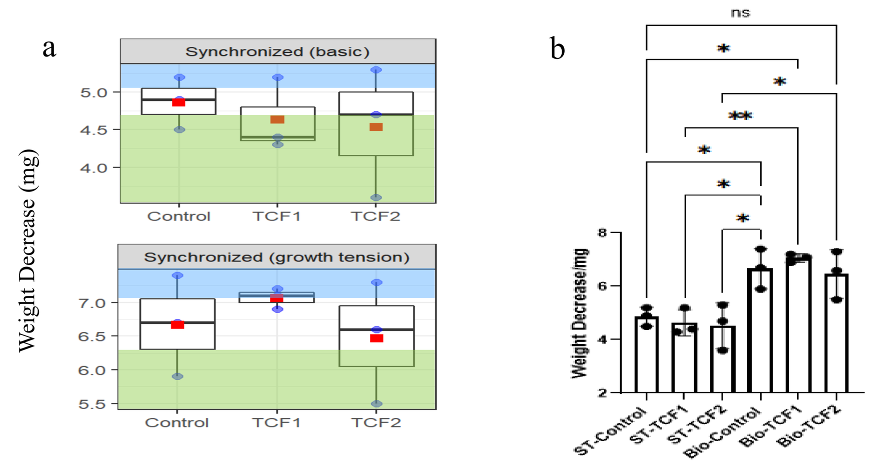
Results

2. **Evaluating mixed component treatment against the base system treatment**



- ❑ Comparing mixed and separate treatment data highlights notable TCF performance differences.

3. **Evaluating TCF treatment under bacterial growth stress**



- ❑ TCF treatment under bacterial growth stress showed TCF1 promoting corrosion while TCF2 inhibited it.

Conclusions

- ❑ Treatment conditions significantly influence TCF effects on data trends, emphasizing the importance of varied conditions.
- ❑ Simultaneous treatment primarily inhibits corrosion and bacterial growth.
- ❑ Under stress, TCF2 effectively inhibits corrosion, while TCF1 restricts corrosion distribution.
- ❑ The study confirms the significant influence of TCFs on system components.
- ❑ TCFs primarily inhibit corrosion and bacterial growth, particularly targeting the biological component.

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