

Motivation and Relevance



Fig. 1 Cookeville Waste Water treatment plant
Ref.Cookeville-tn.gov

Objective and advantage

- Elimination of tedious and costly filtration steps in water treatment with TiO₂.
- Simple and efficient preparation of TiO₂ thin films.

Model Treatment

Acetaminophen (ACE) (N-(4-Hydroxyphenyl acetamide) is over-the counter analgesic drug for relieving minor aches and pains associated with backache, headache, arthritis etc.

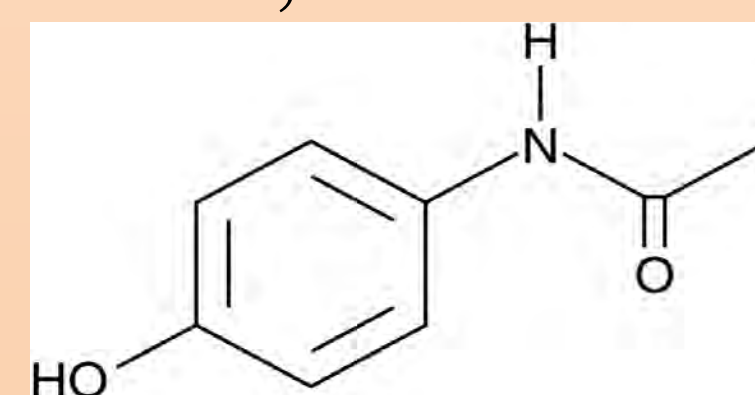


Fig 2. N-(4-Hydroxyphenyl acetamide

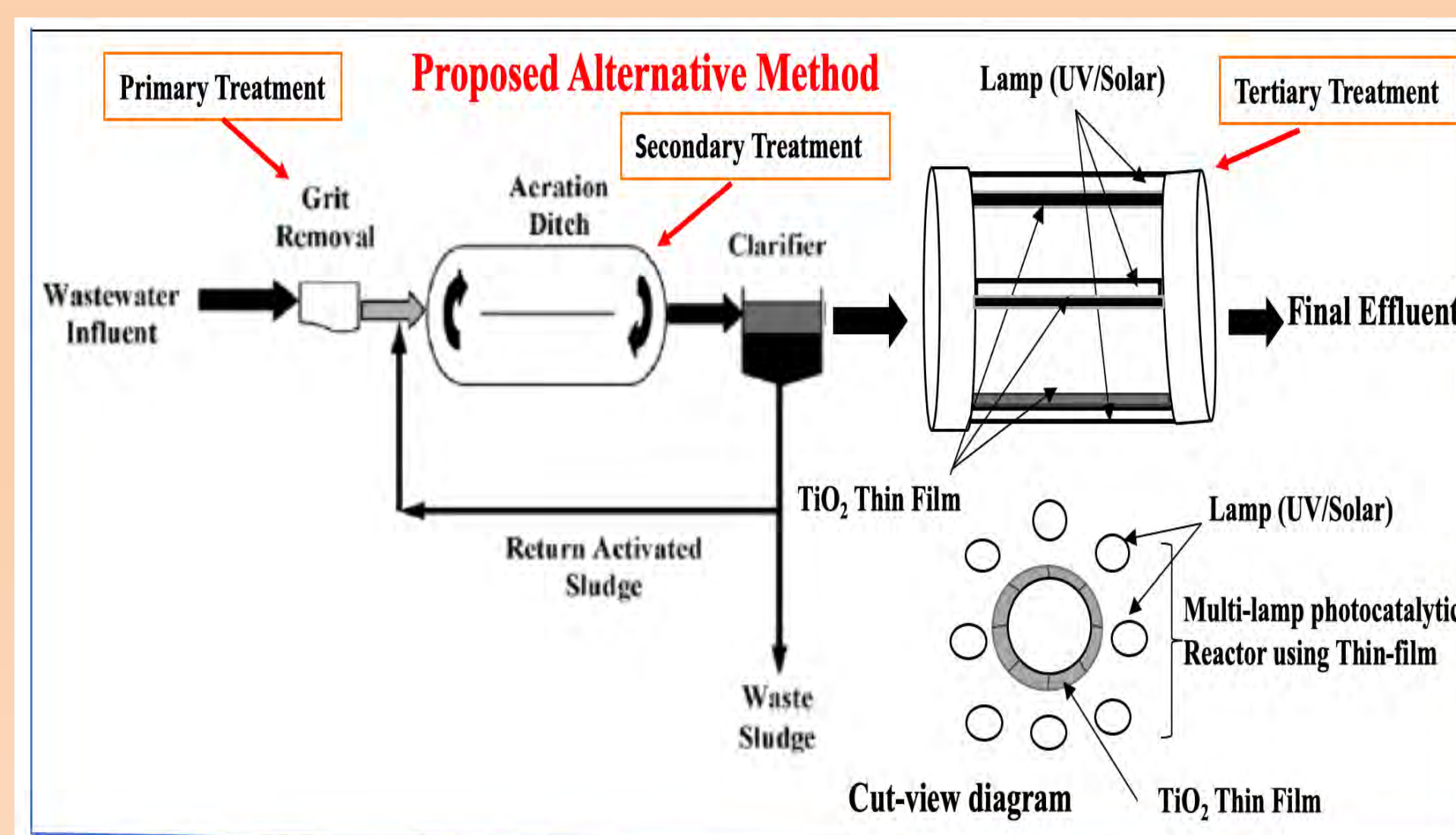


Fig 2. Cookeville wastewater Treatment plant proposed scheme (Modified to include tertiary treatment process)

Materials and Methods

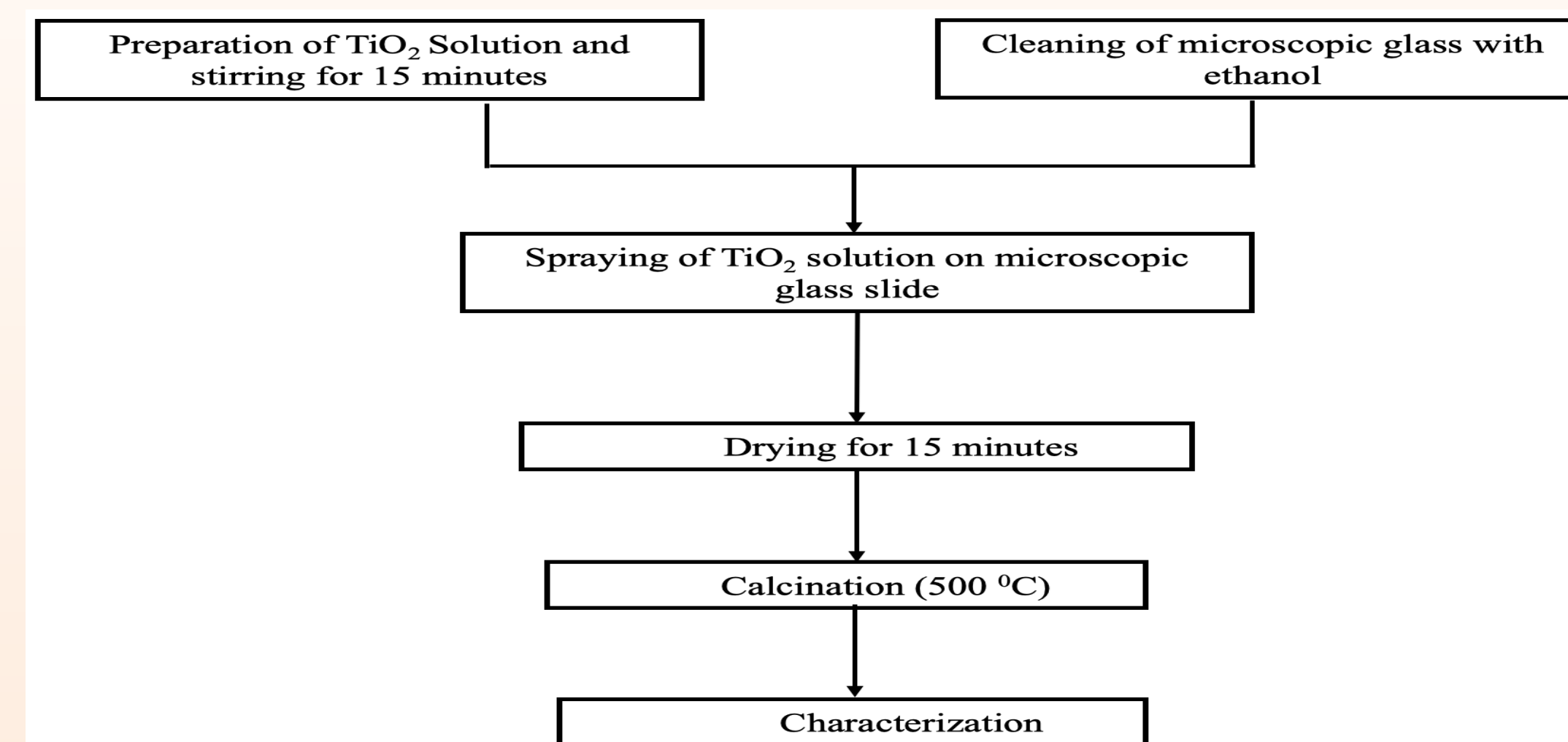


Fig.4 Thin-film manufacturing approach to prepare TiO₂ thin film deposited on the plain microscopic glass surfaces.

- Thin film of 6, 8 and 10 coating layers were inserted on UV-Photocatalytic reactor .
- UV-treatment was conducted for 10, 20, 30 ... up to 90 minutes at room temperature.
- UV-Visible spectrophotometer used to find its absorbance using wavelength 243nm.
- Absorbance was converted to concentration using Beer- Lambert Law $A = \epsilon b C$
A= absorbance , b= path length C= concentration and ϵ = molar absorptivity coefficient



Fig. 5 TiO₂ thin film coating insert on UV Photocatalytic reactor using an aluminum rod.

Results and Discussion

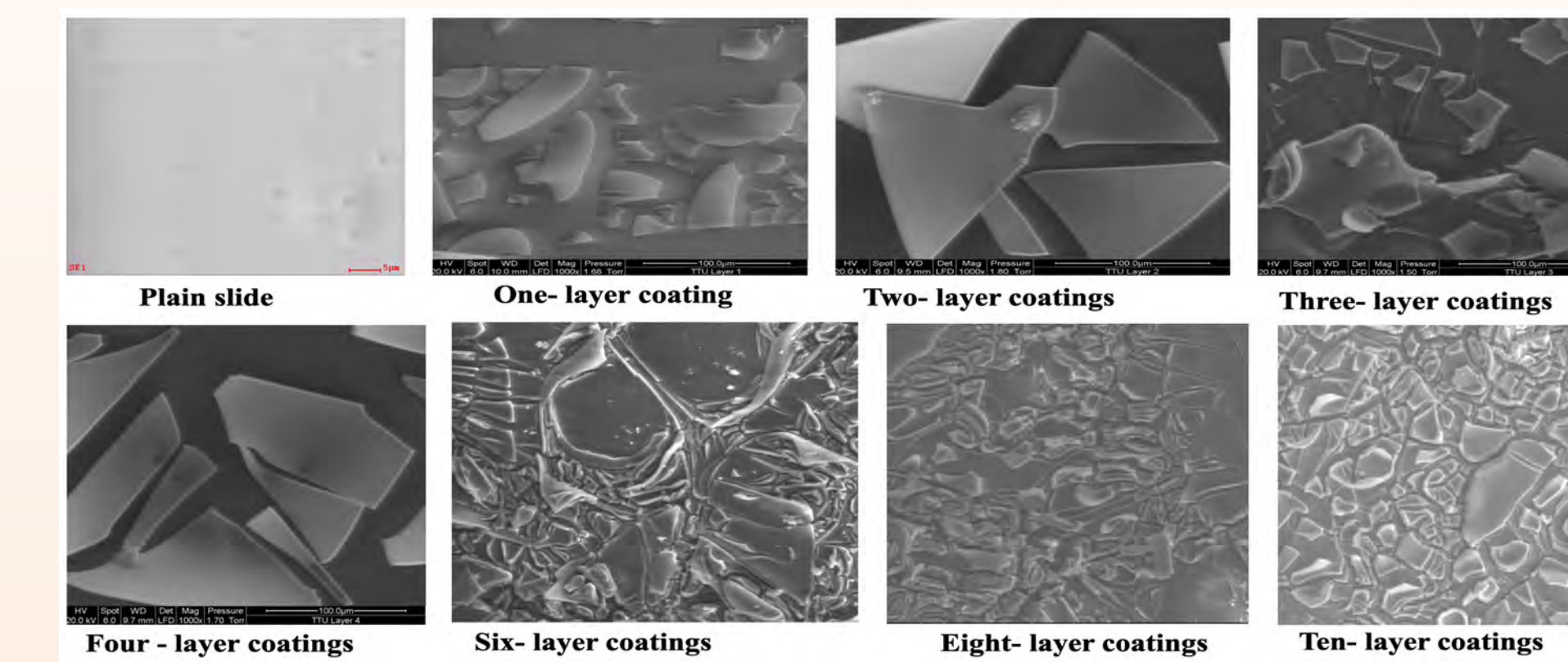
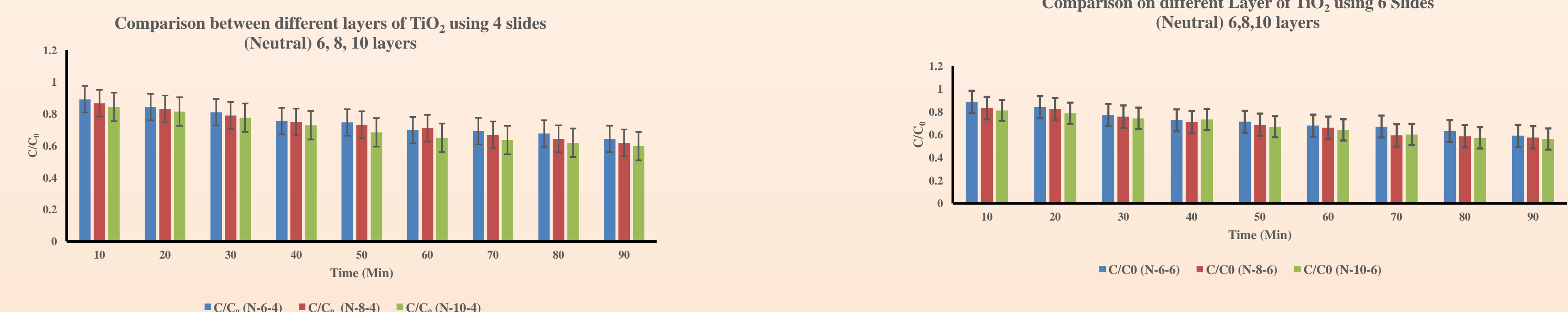
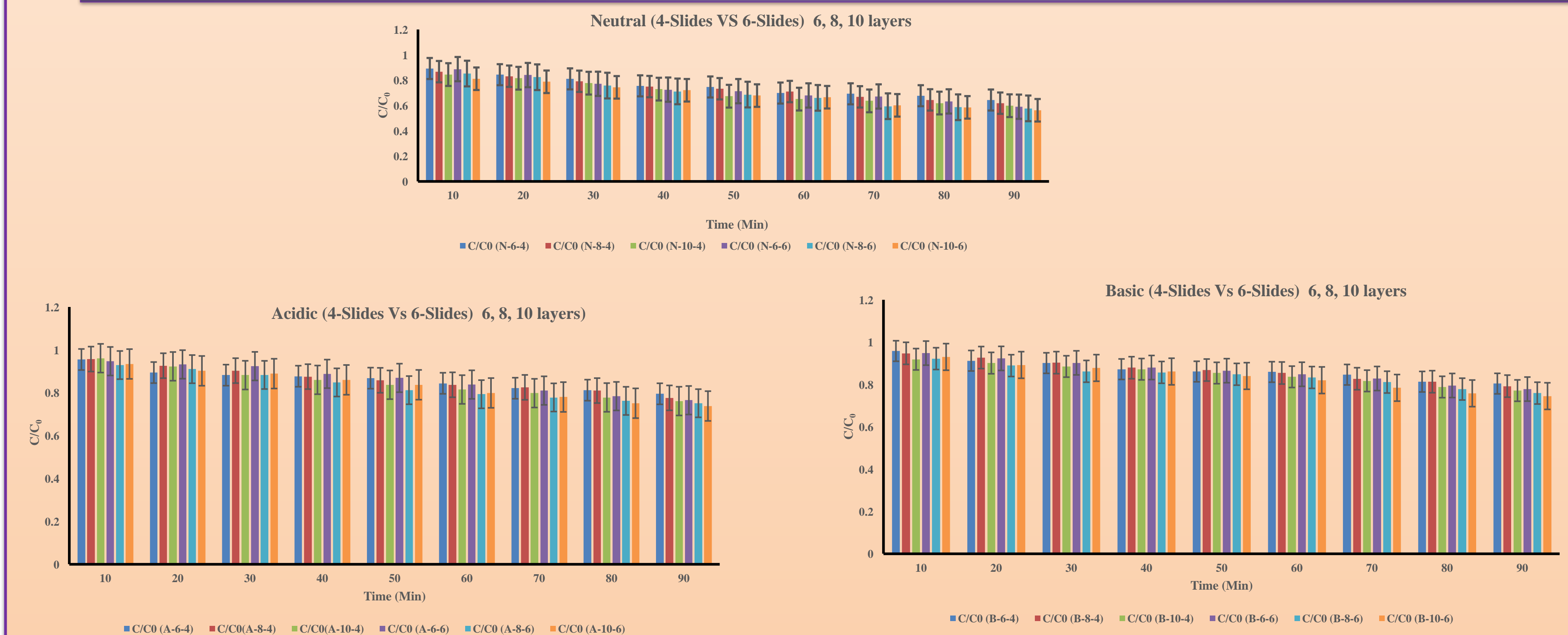


Fig 6. Scanning Electronic Microscopic image of glass slide with 1 to 10 layers of coatings with TiO₂ thin films



- Favorable condition for the ACE degradation (~44%) were identified by using 6-Thin film slides using 10-layer coatings on Neutral medium at 90 minutes of treatment

Comparisons the Degradation of ACE with 4- TiO₂ VS 6-TiO₂ thin film slides using different 6, 8 and 10 layers of coatings.



Future directions

- Explore the better area characterization and determination by other methods and compare with the current ones.
- Detailed kinetic study is needed.
- Proposed possible degradation pathways

Acknowledgement

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Reference

Okoye, N.H., Master Science Thesis , Tennessee Technological University , 2011