REVIEW OF RESEARCH TRENDS IN CORROSION-RESISTANT STRUCTURAL STEELS AND TECHNOLOGY FOR COATING STRUCTURAL STEELS WITH CORROSION-RESISTANT COATINGS

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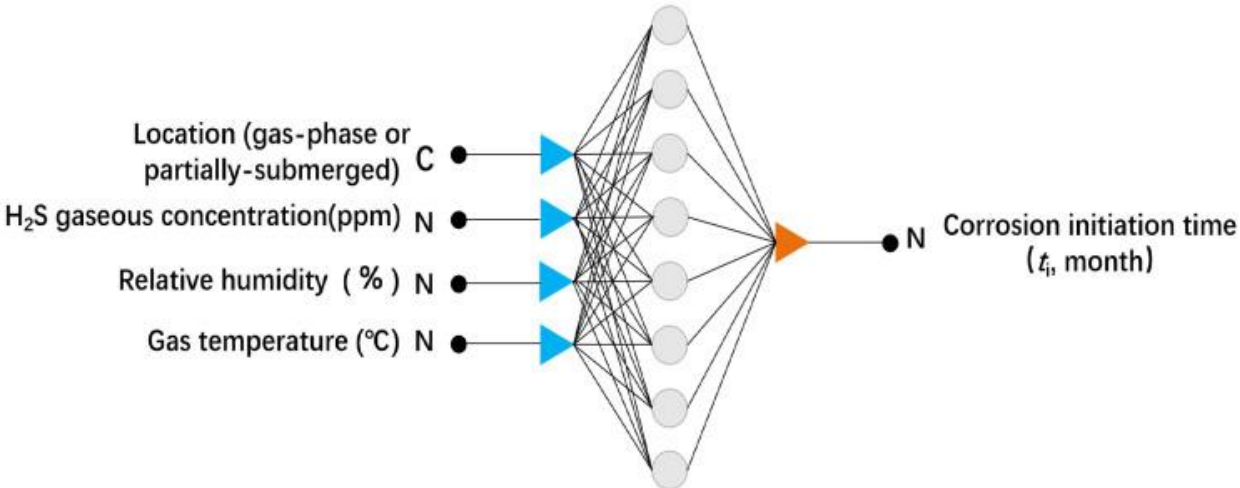
Abstract. This paper provides a review of models commonly used over the years in the study of microscopic models of material corrosion mechanisms, data mining methods and the corrosion-resistant performance control of structural steels. The virtual process of material corrosion is combined with experimental data to reflect the microscopic mechanism of material corrosion from a nano-scale to macro-scale, respectively. Data mining methods focus on predicting and modeling the corrosion rate and corrosion life of materials. Data-driven control of the corrosion resistance of structural steels is achieved through micro-alloying and organization structure control technology. Corrosion modeling has been used to assess the effects of alloying elements, grain size and organization purity on corrosion resistance, and to determine the contents of alloying elements.

Key words; corrosion mechanism, material life, corrosion resistance modulation, modeling and simulation

Introduction. With the development of materials science, the material systems under study are becoming more and more complex, and accordingly, it is becoming more and more difficult to find regularities in complex material systems and develop new materials. The main tools for researching and developing new materials are still based on the researcher's scientific intuition and numerous repeated trial and error experiments. For example, outdoor exposure methods, electrochemical test methods, indoor accelerated simulation methods, etc. These methods can directly or indirectly study the influence and mechanism of a single variable on the corrosion damage process of structural steels[1]. However, the corrosion damage process and time-varying regularities of structural steels are complex and the response signal is weak. It is difficult for traditional methods to accurately investigate the corrosion initiation mechanism of structural steels, and the amount of data obtained by these experimental methods is small and cannot accurately reflect the regular changes of structural steels over time. Therefore, there is a need to consider various factors affecting corrosion in the collection and processing of data streams of structural steels to shorten the experimental period and also to assist in the development of corrosion-resistant structural steels[2].



In recent years, corrosion big data technology has made rapid progress and has become an advanced tool for effectively collecting and analyzing corrosion process data under complex systems[3]. Not only can corrosion data and various environmental factor data be continuously collected, but also multi-dimensional data flow can be realized for modeling and processing. Therefore, the environmental corrosion process and the main factors affecting corrosion have been recently understood. Because corrosion data can immediately reflect the effects of multi-dimensional variables on the output results, the amount of effective data obtained in one week is equivalent to one year or even ten years of data from the traditional method. As a result, the test cycle is greatly reduced and can be applied to the management of corrosion-resistant structural steels[4].

Conclusion

Finite element simulation and boundary element simulation: Finite element method (FEM) is a modern computational method used to decompose the entire problem area, and transforms small areas into simple structural parts that can be easily solved. The application of finite element simulation based on corrosion mechanics is mainly used to study the stress distribution around structural materials or depths. Since the finite element method is not possible for three-dimensional problems and for problems in infinite areas, and therefore the calculation is too intensive for the accuracy of the solution, the use of numerical calculation is a good choice. In cathodic protection engineering, the potential boundary element method is used. Lee constructed a potential distribution model of cathodic protection based on the boundary element method by discretely solving the Laplace equation of the mathematical model of cathodic protection. The results showed that the error of the boundary element method was controlled within 10%, and the estimation error was 5%. Thus, the calculation results were satisfactory.

REFERENCES

1.Koraboyevna, A. S. (2025). TIRE MANUFACTURING TECHNOLOGY. Science, education, innovation: modern tasks and prospects, 2(2), 15-18.

2.Koraboyevna, A. S. (2025). RAW MATERIALS IN THE AUTOMOTIVE TIRE MANUFACTURING INDUSTRY. Science, education, innovation: modern tasks and prospects, 2(2), 12-14.

3.Koraboyevna, A. S. (2025). CRYSTAL LATTICE FORMS IN METALS. Science, education, innovation: modern tasks and prospects, 2(2), 5-7.

4.Adaxamjonovich, O. Z. A. (2024). PRODUCTION OF COMPOSITE MATERIAL USING INDUSTRIAL WASTE. AMERICAN JOURNAL OF MULTIDISCIPLINARY BULLETIN, 2(3), 129-136.

5.Koraboyevna, A. S. (2025). TIRE MANUFACTURING TECHNOLOGY. Science, education, innovation: modern tasks and prospects, 2(2), 15-18.

6.Koraboyevna, A. S. (2025). APPLICATION OF 110G13L STEEL FOR EXCAVATOR BUCKETS IN THE MINING INDUSTRY. Science, education, innovation: modern tasks and prospects, 2(2), 1-4.

7. Kamoldinova, O. B. (2024). PROSPECTS FOR RECYCLING POLYMER WASTE. Bulletin news in New Science Society International Scientific Journal, 1(6), 121-126.

8.Rustamjan o'g'li, A. B. (2025). COMPARISON OF LOCAL AND FOREIGN MATERIALS USED IN BEARING RING PRODUCTION. Science, education, innovation: modern tasks and prospects, 2(2), 87-91.

9. Rustamjan o'g'li, A. B., & Adhamjon o'g'li, A. A. (2025). STUDY OF ITS CHEMICAL PROPERTIESIN OBTAINING ШХ15 MATERIAL FROM SECONDARY MATERIALS. Science, education, innovation: modern tasks and prospects, 2(2), 92-95.

10. Rustamjan o'g'li, B. A., & Isroiljon o'g'li, U. A. RESEARCH OF FRICTION RESISTANCE OF IRON-COMPOSITE MATERIALS.

11. Tursunali o'g'li, Y. F. (2025). KUKUN METALLURGIYASI TOMONIDAN ISHLAB CHIQARILGAN ALYUMINIY ASOSIDAGI METALL MATRITSALI KOMPOZITSIYALAR BO 'YICHA TADQIQOTLAR. INNOVATION IN THE MODERN EDUCATION SYSTEM, 5(48), 44-47.

12. Ibragimovich, K. R. (2025). CUTTING TOOL COATING WITH ELECTRICAL SPARK PLASMA ASSISTED TECHNOLOGY USING WC-CO ALLOYS AND THEIR COMPOSITIONS. Science, education, innovation: modern tasks and prospects, 2(2), 53-55.

13. Raxmatullayev, M. (2025). OBTAINING POLYMER PRODUCTS FROM SECONDARY POLYMER WASTE. EXPLORING NEW HORIZONS IN EDUCATION AND ACADEMIC RESEARCH, 1(1), 69-74.