Chemical deposition and corrosion perspectives on the development of pipe union steel in automobile industry

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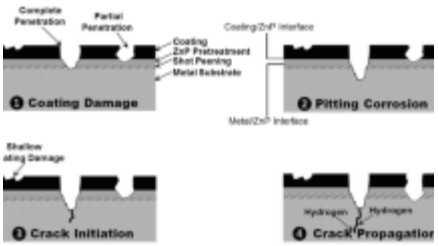
Abstract

Pipe union steel development in the automobile industry necessitates a diversified strategy, notably in terms of surface protection, durability enhancement, and corrosion resistance. This comprehensive research dives into the domain of chemical deposition technologies, primarily electroplating and its derivatives to strengthen steel surfaces against environmental, thermal, and cyclic stressors inherent in car exhaust systems. Electroplating is a flexible technology with numerous applications ranging from corrosion protection and microstructure formation to alloying and the development of high-magnetic force actuators. The research examines electroplating mechanisms, classifies chemical deposition methods, and defines the parameters of an ideal electroplating process. It assesses thin film electrodeposition and autocatalytic or electroless metal deposition, analyzing their benefits, disadvantages, and real-world applications in the automotive industry. It also investigates current research on electroplating applications, environmental problems, and pipe union steel challenges in engineering applications, such as fracture inclinations and material fatigue. Furthermore, this study investigates studies that address environmental contamination caused by electroplating applications, as well as novel methods for reducing hazardous waste. Several experimental and computational researches on steel compositions, alloys, and alternative coatings provide vital insights into enhancing the durability and corrosion resistance of pipe union steel for automotive applications.



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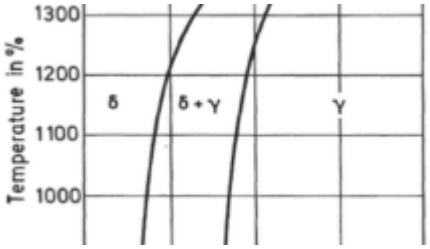

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Not applicable.

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Olumide G. Omoegun: visualization, conceptualization, and writing; Ojo S.I. Fayomi: visualization, conceptualization, and writing—review and editing; Ayodeji A. Ayoola: review and editing; Oluranti Agboola: review and editing.

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The authors declare no competing interests.

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