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Project Title: Characterization of vanadium carbide coatings on steel substrate from thermal diffusion chemical vapor deposition

Project Abstract:
Transition metal carbides have been studied due to their excellent properties, such as high hardness, elevated melting temperature, good chemical and mechanical stability, and high thermal conductivity. These characteristics ensure their applications as high-temperature materials and/or components requiring high wear resistance. A hard vanadium carbide layer formed by diffusion process has excellent properties such as very high abrasion and adhesion resistance and good tribo-chemical performances. A vanadium carbide layer with 3500 HV protects the surface of tools or dies of abrasion when processing different materials which contain abrasive particles. Although, the vanadium carbide coating form on steel by diffusion compose of two layers, there are few investigations on the compositions and phases of those layers. The goal of this project is to understand the chemistry of the coating through different techniques.

Project Deliverables:
• The composition and structure of white layer as well as gray layer that is underneath the white layer (Under the optical microscope the top layer looks like white while the bottom layer looks like gray).
• The parameters that control the existence and the thickness of white layer
• The distribution of iron in coating layer