Synthesis, Mechanical and Chemical Characterization, and Tribological Testing of Iron-Doped Hydrogenated Amorphous Carbon Coatings*

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Abstract

The field of doped carbon coatings has evolved considerably due to increased interest in using diamond-like carbon coatings for lubricated applications. Many studies have been done on tungsten, chromium, titanium, or silicon dopants, but few studies of iron as a dopant have been performed. Additives in many synthetic lubricants are designed to interact with ferrous surfaces, and iron-doped carbon coatings may further enhance their tribological performance during sliding in the boundary lubrication regime. Such improved performance could consequently enable wider use of iron-doped carbon coatings in industry. In this study, iron-doped hydrogenated amorphous carbon coatings were deposited in a reactive physical vapor deposition method. The coatings were tribologically tested with a ball-on-disc tribometer after mechanical and chemical characterization. The effect of iron dopant concentration on friction and wear during boundary lubricated sliding in varying conditions was studied.