

# Friction behavior of CVD graphene deposited on steel

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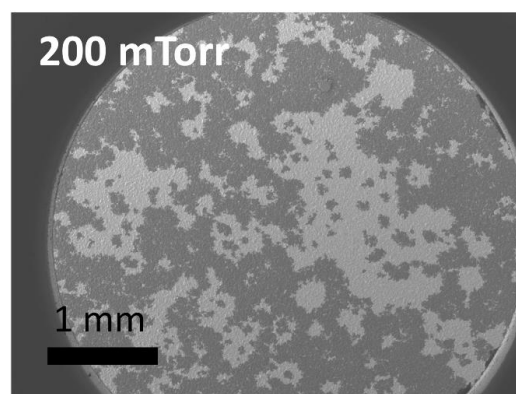
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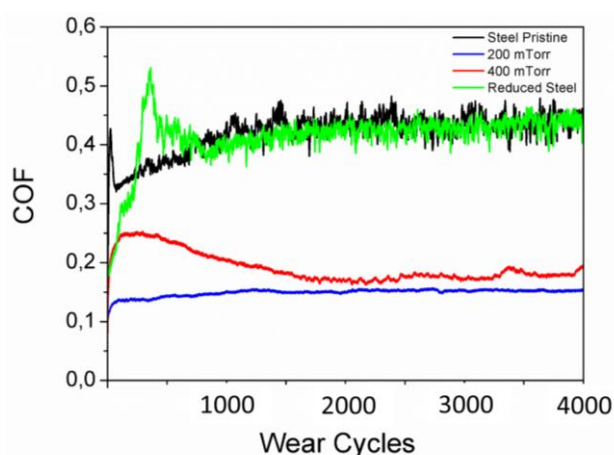
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Single and few-layers graphene were grown by low-pressure chemical vapor deposition on polished low carbon steel samples (API X80) using ethanol as precursor at different pressures at 1000 °C: 200 and 400 mTorr. The substrates were first reduced in hydrogen at the same temperature during 3 hours in a hydrogen flow of 20 sccm. The samples were characterized by Raman spectroscopy and the Raman maps clearly show the formation of an inhomogeneous graphene coating with surface regions covered with a single-layer, bilayer, multilayers graphene or nanocrystalline, the last one covering most of the surface area of the sample when the sample was prepared at 400 mTorr. Scanning electron microscopy revealed the partial coverage of the sample surface when the graphene coating was prepared at pressure of 200 mTorr. Friction measurements were performed using a CTER micro-tribometer in a ball-on-flat contact geometry with an inox steel ball as counter body. An important reduction of the COF was verified even with a partial coverage of the steel surface.

Figures



**Figure 1:** SEM image of the sample prepared at 200 mTorr.



**Figure 2:** Coefficient of friction (COF) measured at a load of 0.3 N for different sliding pairs: pristine steel against the steel ball, reduced steel against the steel ball, graphene coated steel deposited at 200 and 400 mTorr against the steel ball. Pristine steel is an as-received AISI X80 steel sample, while reduced steel is the sample submitted to reduction process in hydrogen atmosphere.