A Method for Mitigating Carbon Fouling Using Electrochemical Etching

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- Aeronautics
- Materials and Manufacturing

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- Superphilic
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Researchers at Purdue University have developed a new electrochemical method to prepare superphilic and superphobic metal surfaces to reduce carbon fouling. This technology has the potential to reduce carbon deposition/fouling due to the reduction in contact area attributed to the dense, nano-featured structures. Carbon fouling is a problem across industries in which carbonaceous fuels are burned, such as aviation, power, and automotive. To prepare nano-featured surfaces, nano-scale roughening and surface tension reduction on the metal surface must be completed. Previous researchers have applied laser engraving, lithography, and sol gel coatings to complete these steps. Laser engraving and lithography are precise methods but have poor scalability, and sol-gel deposition may cause chemical compatibility issues. The Purdue researchers' electrochemical etching method can be applied to nearly any metal surface at large scale and is only a reductive chemical process. The researchers created individualized conditions (e.g. current density) depending on the type of alloy to create superphilic or superphobic surface conditions.

Technology Validation: The researchers successfully applied their nano-featuring method to a variety of alloy surfaces, creating superphilic and superphobic surfaces and measuring conditions such as surface roughness and water contact angle.

Advantages:
- Non-toxic chemicals used
- Process performed at ambient temperatures and pressures

Applications:

- Preventing carbon fouling in fuel systems in aviation, power, and automotive industries

People:

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Intellectual Property:

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