Porous Perovskite Nickelates with Enhanced Electrochromic Properties and Systems Thereof

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- Chemical Engineering
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- Porosity
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Researchers at Purdue University have developed a class of microstructurally engineered electrochromic materials featuring porous perovskite nickelates, $NdNiO_3$ (NNO). Electrochromic materials operate well at high temperature and in gaseous environments, making them ideal for smart windows in vehicles, aircraft, buildings, and protective eyewear. NNO films uniquely feature superior opacity, greater voltage bias, and higher cost efficiency than traditional materials. A nanoporous design for electrochromic layers of smart windows is desirable because it provides enhanced coloration efficiency. Purdue researchers have fine-tuned a mature, convenient fabrication process for electrochromic films featuring optimized pore density through hydrogen doping, allowing for a transparent surface structure which has been verified by scanning electron microscopy. At least 93% of electroactivity was retained by this technique over 400 cycles, ensuring electrochemical stability. In testing with visible light, optical transmittance of 37-43% was obtained and a wavelength of 632.8 nm was modulated by 40-45% between color and original state by comparison. A smart windows design could include a middle electrolyte layer, ion storage layer, and the new enhanced NNO film for energy savings.

Advantages:
-Reliable
-Superior opacity
-Cost efficient

Potential Applications:
-Aerospace
-Automotive
-Buildings/construction

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