

New mechanism converts natural gas to energy faster, captures CO₂

May 7 2013, by Matt Shipman

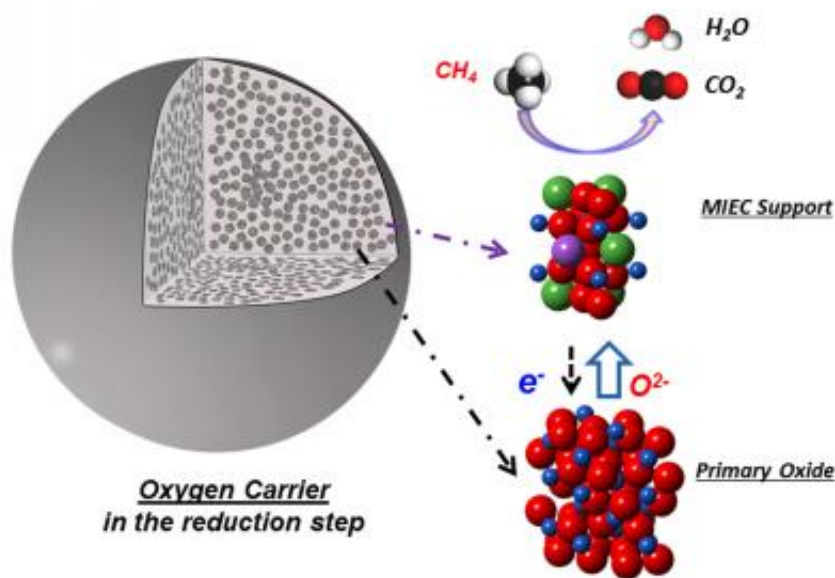


(Phys.org) —North Carolina State University researchers have identified a new mechanism to convert natural gas into energy up to 70 times faster, while effectively capturing the greenhouse gas carbon dioxide (CO₂).

"This could make power generation from natural gas both cleaner and more efficient," says Fanxing Li, co-author of a paper on the research and an assistant professor of chemical and biomolecular engineering at NC State.

At issue is a process called chemical looping, in which a solid, oxygen-laden material – called an "oxygen carrier" – is put in contact with natural gas. The oxygen atoms in the oxygen carrier interact with the natural gas, causing combustion that produces energy.

Previous state-of-the-art oxygen carriers were made from a composite of inert [ceramic material](#) and [metal oxides](#). But Li's team has developed a new type of oxygen carrier that include a "mixed ionic-electronic conductor," which effectively shuttles [oxygen atoms](#) into the natural gas very efficiently – making the chemical looping combustion process as much as 70 times faster. This mixed conductor material is held in a nanoscale matrix with an [iron oxide](#) – otherwise known as rust. The rust serves as a source of oxygen for the mixed conductor to shuttle out into the natural gas.



NC State University researchers have developed a new type of oxygen carrier

that include a "mixed ionic-electronic conductor," which effectively shuttles oxygen atoms into natural gas very efficiently -- making the chemical looping combustion process as much as 70 times faster. Credit: Fanxing Li, North Carolina State University

In addition to energy, the combustion process produces [water vapor](#) and CO₂. By condensing out the water vapor, researchers are able to create a stream of concentrated CO₂ to be capture for sequestration.

Because the new oxygen carrier combusts natural gas so much more quickly than previous chemical looping technologies, it makes smaller chemical looping reactors more economically feasible – since they would allow users to create the same amount of energy with a smaller system.

"Improving this process hopefully moves us closer to commercial applications that use chemical looping, which would help us limit [greenhouse gas emissions](#)," Li says.

More information: The paper, "Iron Oxide with Facilitated O₂ – Transport for Facile Fuel Oxidation and CO₂ Capture in a Chemical Looping Scheme," was chosen as part of the cover page story in the March issue of *ACS Sustainable Chemistry & Engineering*.

pubs.acs.org/doi/abs/10.1021/sc300177j

Provided by North Carolina State University

Citation: New mechanism converts natural gas to energy faster, captures CO₂ (2013, May 7) retrieved 1 May 2024 from

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