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TRACKING TRENDS & PERFORMANCE IN BASIC RESEARCH

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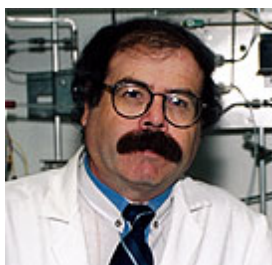
2009 : May 2009 - Fast Moving Fronts : Nazim Muradov

FAST MOVING FRONTS - 2009

May 2009



Nazim Muradov talks with *ScienceWatch.com* and answers a few questions about this month's Fast Moving Front in the field of Engineering.



Article: From hydrocarbon to hydrogen-carbon to hydrogen economy

Authors: Muradov, NZ;Veziroglu, TN

Journal: INT J HYDROGEN ENERG, 30 (3): 225-237 MAR 2005

Addresses: Univ Cent Florida, Florida Solar Energy Ctr, 1679 Clearlake Rd, Cocoa, FL 32922 USA.

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Univ Miami, Clear Energy Res Inst, Coral Gables, FL 33124 USA.

SW: Why do you think your paper is highly cited?

This paper offers a novel concept for addressing the energy and environmental issues that will arise during the transition from the present fossil-based economy to a sustainable carbon-neutral economy of the future. This is a very important and highly debated subject amongst scientists and policymakers alike.

SW: Does it describe a new discovery, methodology, or synthesis of knowledge?

This is a concept paper outlining a new way of producing clean fuels and advanced structural materials from traditional fossil-based resources (e.g., natural gas) in an environmentally sustainable way. As such, the paper is a synthesis of knowledge rather than a new scientific discovery.

SW: Would you summarize the significance of your paper in layman's terms?

In the near term, production of energy and transportation fuels will likely rely on the use of fossil resources, and hence, remain a source of significant CO₂ emissions into the atmosphere. CO₂ sequestration in geological formations or under the ocean seems to be a low-hanging-fruit solution to this problem. The real issue, however, is that the long-term ecological consequences of CO₂ sequestration cannot be adequately predicted given the current state of knowledge, and many experts are cautious about this "quick fix" approach.

The authors propose an alternative fossil decarbonization strategy involving conversion of hydrocarbons to hydrogen and carbon, with hydrogen used as a clean fuel and carbon used in structural materials. This strategy would allow taking advantage of the existing fossil-based infrastructure without an adverse environmental impact—securing a smooth carbon-neutral transition from the fossil-based economy to a future hydrogen economy.

SW: How did you become involved in this research and were any particular problems encountered along the way?

I became interested in the idea of hydrogen as an inexhaustible and environmentally clean fuel after reading a series of articles authored by professors Nejat Veziroglu (the co-author of the subject paper), John O'Bockris, Cesare Marchetti, and other pioneers of the hydrogen movement (they are dubbed "Hydrogen Romantics"). For the past 20-plus years, I have been involved in various aspects of hydrogen energy research.

Presently, at the Florida Solar Energy Center (FSEC), we are engaged in the development of solar-powered water-splitting cycles for hydrogen production, hydrogen sensors and detectors, hydrogen storage technologies, biomass-to-fuel processes and hydrogen fuel cells, among others.

Over the years, we have seen ups and downs in the support for hydrogen research. It is our hope, that by continuing high quality and innovative research, we'll be able to maintain the steady pace of progress in the development of efficient processes for the production, storage, and utilization of hydrogen that are the basis of a future hydrogen economy.



FSEC researchers are testing a new catalyst for hydrogen production from methane.

SW: Where do you see your research leading in the future?

The development and implementation of new CO₂-free routes to hydrogen production from hydrocarbons with recovery of solid carbon products presents an environmentally sound alternative to CO₂ capture and sequestration. The recovered carbon can be used in the production of advanced structural materials, reducing the use of conventional materials such as steel and concrete, whose production contributes significantly to global greenhouse gas emissions.

It is plausible that efficient and cost-effective processes for the capture of atmospheric CO₂ and its conversion to fuels or solid carbon using renewable hydrogen will be developed in the near future. This will provide a further relief in the carbon-constrained world and boost the prospects of a hydrogen economy.

SW: Do you foresee any social or political implications for your research?

We are approaching a critical period in the fossil fuel era, marked by the rapid depletion of economically affordable oil reserves and the prospects of accelerating global climate change—both with dire consequences for industrial civilization. A hydrogen economy has the potential to end our reliance on fossil fuels and clean up the environment, thus, preventing a global catastrophe.

Because hydrogen can be produced anywhere in the world, it will fundamentally change social and economic interplay and prevent political upheaval. It is important to begin the transition to the hydrogen economy, sooner rather than later, so there are sufficient time and resources to complete the transition and avoid destabilizing the global climate.

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KEYWORDS: FOSSIL-FUELS; CO₂; METHANE; DECARBONIZATION; SEQUESTRATION; DECOMPOSITION; TECHNOLOGY; ENERGY; SOILS; BLACK.



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