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Biofuels - August 2008

Interview Date: August 2008



Dr. Milford Hanna

 From the Special Topic of [Biofuels](#)

In our analysis of biofuels research over the past decade, the work of Dr. Milford Hanna ranks at #1 by total citations. His 1999 Bioresource Technology paper, "Biodiesel production: a review," (Ma FR and Hanna MA, 70[1]: 1-15, October 1999), is the most-cited paper over the past decade in our analysis, with 300 citations.

According to [Essential Science IndicatorsSM](#) from [Thomson Reuters](#), Dr. Hanna's work ranks in the top 1% among researchers worldwide in the field of [Agricultural Sciences](#). He has also been named a [Highly Cited Researcher](#) in this field.

Dr. Hanna is the Director of the Industrial Agricultural Products Center and the Kenneth E. Morrison Professor of Biological Systems Engineering and Food Science & Technology at the University of Nebraska-Lincoln.

In the interview below, ScienceWatch.com talks with Dr. Hanna about his highly cited work, including his research on biofuels.

SW: Please tell us a little about your research and educational background.

I received my B.S., M.S., and Ph.D. in agricultural engineering from The Pennsylvania State University in 1969, 1971, and 1973 respectively. I taught agricultural engineering at California State Polytechnic State University for two years before joining the agricultural engineering faculty at the University of Nebraska in 1975. Since about 1980, my research program has had a heavy emphasis on bioprocess engineering and more specifically on finding new industrial (non-food) uses for agricultural commodities such as corn and soybeans.

SW: What prompted you to publish on biofuels?

In 1979, I had the opportunity to get involved in biofuels research because of then-"high" gas prices, a regional interest in soybean utilization, and interest from a graduate student to work in the biodiesel area.

SW: Your most-cited paper in our biofuels Special Topic is the 1999 *Bioresource Technology* review, "Biodiesel production: a review." Would you sum up the major points of this paper for our readers?

This manuscript reviews the ways vegetable oils and animal fats can be processed for use as mobile fuels with a particular emphasis on the state-of-the-art of the transesterification

process, which is the generally accepted method of converting fats and oils to biodiesel today.

SW: In 2005, you published another review, "Biodiesel: current perspectives and future," (*Journal of Scientific & Industrial Research* 64[11]: 854-7, November 2005). What had changed in the field between the 1999 paper and this one?

The industry, although still in its infancy in 2005, had developed significantly since 1999. There were numerous biodiesel production facilities in operation. Reality was beginning to set in that there would be a shortage of available fats and oils for biodiesel production, certainly in terms of being able to replace a significant amount of the 40 to 50 million gallons of diesel fuel that are burned in the USA annually. From a production standpoint, researchers and processor were getting serious about improving the transesterification process through the use of heterogeneous (as opposed to homogeneous) catalysts and being able to use lower-quality feedstocks such as used cooking oils and animal fats. Blending biodiesel with ethanol and diesel fuel (EB-diesel), the advantages of EB-diesel, and the potential performance problems were being discussed widely.

SW: It's now been almost three years since that last review—have there been any more significant developments in biofuels since then? What future can you predict for biofuels research?

I don't know that there is a particularly different emphasis in the area of biodiesel research today but (1) the interest in heterogeneous catalysts remains strong and needs further development; (2) the need for alternative oilseed production is apparent; and (3) glycerol (by-product) utilization needs to be brought into focus.

SW: Judging by your publication record, you also do a lot of work with extruded starch acetates. What is the significance of these materials?

Starches are used to a significant extent to produce water-soluble (environmentally and biodegradable) packaging "peanuts." The water solubility aspect limits the use of starch to such a use and even limits its use within that application because it presents some performance issues. Starch acetate is much less water soluble and can, in fact, be made virtually water resistant. Such a characteristic lends itself to much broader and higher-value applications such as egg cartons, meat trays, and disposable plates. The shortcoming, at this point, is the cost of acetylating starch.

SW: What should the "take-away lesson" about biofuels be for the general public?

In my mind, it is important that we think in terms of alternate fuels (biofuels) being used to reduce the increase in petroleum-based fuels use, as opposed to reducing the use of the same. As countries such as China and India develop, their use of petroleum-based fuels continues to increase significantly, in direct competition with the US for the available oil. Overall, conservation and improved efficiency need to become part of our strategic energy-use plan. These offer opportunities for significant reductions in energy use, which should, at least, reduce the rate of increase in use. ■

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Dr. Milford Hanna's most-cited paper with 300 cites to date:

Ma FR and Hanna MA, "Biodiesel production: a review," *Bioresource Technol.* 70(1): 1-15, October 1999. Source: *Essential Science Indicators* from Thomson Reuters.

Additional Information:

Dr. Milford Hanna is featured in [ISIHighlyCited.com](http://www.ISIHighlyCited.com)

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Keywords: biofuels, biodiesel, transesterification, vegetable oils, animal fats, heterogenous catalysts, extruded starch acetates.



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