NEW HOT PAPERS - 2009

March 2009

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Peide D.Ye talks with *ScienceWatch.com* and answers a few questions about this month's New Hot Paper in the field of Engineering.

"Atomic layer deposition (ALD) system."

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Article Title: Submicrometer inversion-type enhancement-mode InGaAs MOSFET with atomic-layer-deposited Al2O3 as gate dielectric
Authors: Xuan, Y;Wu, YQ;Lin, HC;Shen, T;Ye, PD
Journal: IEEE ELECTRON DEV LETT
Volume: 28
Issue: 11
Page: 935-938
Year: NOV 2007
* Purdue Univ, Sch Elect & Comp Engn, W Lafayette, IN 47907 USA.
* Purdue Univ, Sch Elect & Comp Engn, W Lafayette, IN 47907 USA.
(addresses have been truncated)

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

While the community is struggling to have high drive current in III-V MOSFETs (metal–oxide–semiconductor field-effect transistors), this paper demonstrates the pathway using a high-k/InGaAs material system.

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

It uncovers a new MOS material system with high-k as oxide and InGaAs as channel material.

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

It provides a path to the realization of high-performance III-V MOSFET for post Si-CMOS applications. There are still many technical challenges needed to be overcome before it becomes a really manufacturable technology.

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

I was hired by Bell Labs/Agere Systems to work on this problem. I have continued my research in this field after becoming a faculty member at Purdue University.

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

This research became quite important since the Si industry is heading toward the physical limitations of scaling. We have to use high-mobility channel materials such as III-V, in order to maintain dimension and performance-scaling.

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

We have demonstrated the high-performance inversion-type E-mode $In_{0.53}$ $Ga_{0.47}As$ MOSFETs using

ALD high-? gate dielectrics. These results suggest that $In_{0.53}$ $Ga_{0.47}As$ could be an ideal channel material, which has higher electron effective mobility, low surface recombination velocity to have enough inversion charge, and wide enough bandgap for the ultimate complementary metal–oxide–semiconductor (CMOS) applications with low drain voltage. The potential economic effect is enormous for the future of this research.

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KEYWORDS: FIELD-EFFECT TRANSISTOR; CHANNEL MOSFETS; GAAS MOSFETS; OXIDE; PASSIVATION; TECHNOLOGY; INSULATOR; MOBILITY; FILM.

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