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Micro-Windmill Surprise

by Bryon Moyer

January 30, 2014 at 3:59 PM

It's one of those good problems.

You've been doing some exploratory MEMS work. Your main focus is biomedical – implants for dealing with prostate cancer. Silicon is too brittle, so you do some exploration with a foundry to experiment with different structures and materials. A nickel alloy looks interesting – more forgiving than silicon (at the expense of a lower Young's modulus). And there's some extra space on the die.

One a whim, you and a co-researcher half-jokingly discuss putting a windmill on there. During the discussion, she is watching her daughter play with a pinwheel. Inspiration strikes, and overnight she completes a design that goes onto the die. Despite the auspicious name of the MEMS company you're working with, WinMEMS (one letter away from WindMEMS), you think it probably won't work.

Only… it does work. Not only does it function as expected, but someone accidentally drops some on the ground – and they still work.

What do you do now?

Most academics would publish. But here's the deal: you've been burned before by companies that have leveraged your work with nothing coming back to you. And universities don't like this either. So you don't publish: you patent. And you delay telling the world about it for a couple months until the lawyers relax.

And then you issue a press release.

And then you give up any hope of getting any work done until the phone stops ringing.

This has been life for Dr. Jung-chih Chiao and Dr. Smitha Rao at the University of Texas in Arlington. They've been totally sidetracked by the surprising (to him) success of this little side project.

Because no paper has been published, there's no end of questions about how they achieved their results. There were some **pictures** (http://www.eejournal.com/archives/fresh-bytes/this-super-tiny-windmill-could-someday-charge-your-phone/), but no details, especially

about such critical aspects as, how do they convert the motion into electrical energy? I discussed that with Dr. Chiao, but apparently I didn't ply him with enough drink to get him to give up the secret. So it remains a secret.

I was actually the 20th person to talk to him. They've been bombarded not just with press, but with companies wanting in on the action. They're not just calling him; they're calling colleagues as well. So they're remaining tight-lipped for now.

He's pretty confident in the design that they've done – they've aimed for simplicity in order to ensure reliability, but there are still issues to be solved. The two main ones are figuring out how to keep dust from mucking up the works and new ways of countering stiction.

They will be looking for commercialization partners. He sees the university's role as solving the basic physics, including the two problems just mentioned. There will be other changes before anything goes into full production, but he sees the partner company doing that work. And he's confident that this thing is manufacturable. Depending on funding, he sees this as being completed on about a one-year horizon.

After his work on this has been completed, he's looking at possibly putting together a simulation tool. Depending on where you want to place the micro-windmills – cars, bridges, wherever – you may want to optimize the design. A simulation tool would make that possible.

For right now, it's more basic: the phone needs to quiet down so they can get back to doing actual research.

And we're still going to have to wait to figure out how this all works.

Channels

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