Thinking small: Texas A&M team creates lab-on-a-chip

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Imagine an entire chemistry laboratory reduced to the size of a postage stamp. It could happen.
While others may think big, Texas A&M University physicists Don Naugle and co-worker Igor Lyuksyutov are thinking small - as in micro small. They have successfully managed to levitate micron-sized fluids using magnets, which could lead to new advances in medicine, chemistry, chemical engineering and other related fields.

By using small magnets on a postage-stamp sized chip, Naugle and Lyuksyutov have managed to move and merge tiny levitating droplets and crystals and to control the orientation of the levitating crystals.

The droplets used were as small as bacteria or 100 times smaller than a human hair, and up to one billion times smaller in volume than has been demonstrated by conventional methods.

Their work was recently published in Applied Physics Letter and featured in several science journals. Their research is funded by The Robert A. Welch Foundation and National Science Foundation grants.

"It might be possible to do the same thing with a large number of fluids, chemicals or even a virus," Naugle explains.

"The Texas A&M team has managed to move and levitate several substances, including alcohol solutions, oils, some types of powders and even red blood cells and bacteria. It could be theoretically possible to

reduce an entire chemistry lab to a few postage-stamp sized chips.

"Try to picture individual chemical beakers (droplets) being merged into other chemical beakers. That's the principal involved here."

Naugle calls the method a "lab on a chip" and says the possibilities are exciting.

"The lab-on-a-chip device levitates and manipulates diamagnetic objects, which are very weakly repelled by magnets," he notes.

"These include living tissue and other objects and substances you don't think of as being magnetic."

The new procedures could be applied to other fields, he believes.

"Though it has taken several years to achieve the droplet levitation process, we need to see if we can make progress with manipulating DNA, nanotubes and other things using both magnetic and electric fields. It would be exciting to see if we could precisely transport levitating nanotubes into predefined positions on a silicon chip. This could open up even more doors for future research."

Source: Texas A&M University