Simulations predict flat liquid

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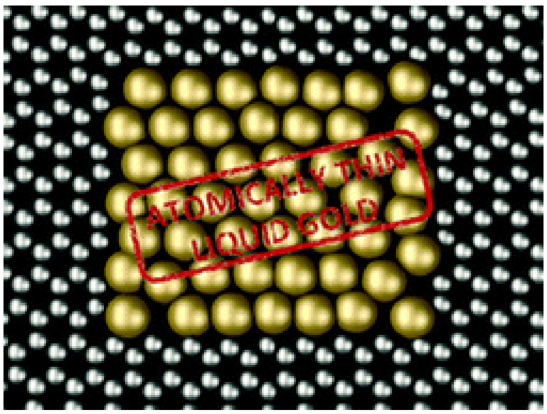

Computer simulations have predicted a new phase of matter: atomically thin two-dimensional liquid.

This prediction pushes the boundaries of possible phases of materials further than ever before. Two-dimensional materials themselves were considered impossible until the discovery of graphene around ten years ago. However, they have been observed only in the solid phase, because the thermal atomic motion required for molten materials easily breaks the thin and fragile membrane. Therefore, the possible existence of an atomically thin flat liquid was considered impossible.

Now researchers from the Nanoscience Center at the University of Jyväskylä, led by Academy Research Fellow Pekka Koskinen, have conducted computer simulations that predict a liquid phase in atomically thin golden islands that patch small pores of graphene. According to the simulations, gold atoms flow and change places in the plane, while the surrounding graphene template retains the planarity of liquid membrane.

"Here the role of graphene is similar to circular rings through which children blow soap bubbles. The liquid state is possible when the edge of graphene pore stretches the metallic membrane and keeps it steady", Koskinen says.

The liquid phase was predicted by computer simulations using quantum-mechanical models and nanostructures with tens or hundreds of gold atoms. The prediction was published recently in the esteemed journal *Nanoscale*. Currently the liquid state exists only in computers and is still waiting for experimental confirmation.

"Unfortunately, simulations suggest that the flat liquid is volatile. In experiments the liquid membrane might burst too early, like a soap bubble that bursts before one gets a proper look at it. But again, even graphene was previously considered too unstable to exist," Koskinen says.

More information: "Plenty of motion at the bottom: atomically thin liquid gold membrane," *Nanoscale* (2015) pubs.rsc.org/en/content/articl … /unauth#!divAbstract

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