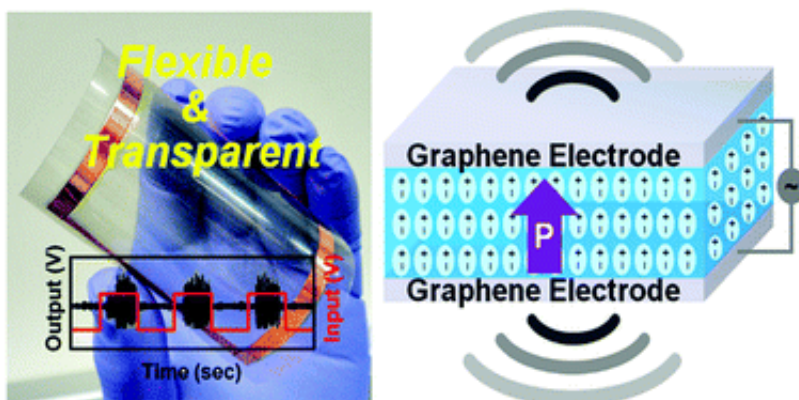


# Korean researchers use graphene to create transparent loudspeakers

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(PhysOrg.com) -- In yet another novel use for graphene, researchers from Seoul University have devised a method of creating transparent loudspeakers by printing them onto a special kind of plastic, using an ordinary inkjet printer. Jyongsik Jang and coworkers describe the process in *Chemical Communications*.

Graphene, is a single layer of graphite, and has been in the news a lot of late, since first being isolated by Andre Geim and Konstantin Novoselov (which won them the Nobel prize in physics last year), due to its unique properties. Some have even suggested it will completely revolutionize the entire technology field. To create [loudspeakers](#) from graphene, the researchers used a simple four step process.

The first step as described in the paper, was to synthesize the Graphene Oxide (GO) using a method previously demonstrated by other researchers. Next, the GO was exfoliated in water using sound waves to prevent the inkjet printer [nozzles](#) from clogging. The result was then flushed with water to remove any [impurities](#). After that, an empty inkjet printer cartridge was thoroughly cleaned and the graphene “ink” inserted into it.

To create the surface on which to print their special ink, a low temperature oxygen plasma treatment was performed on the surface of a piece of Poly (vinylidene fluoride) (PVDF).

Next, the newly created ink was printed onto the treated PVDF (repeatedly on both sides) using a commercially available inkjet printer, creating graphene electrodes. The output was immediately immersed in a hydrazine and ammonia solution (in a vacuum) for 3 minutes. This completed the [graphene](#) portion of the speaker construction, the rest of the project consisted mostly of hooking up normal acoustic electronics parts as are found in regular speakers. The resulting speakers work by generating a piezoelectric effect that causes the PVDF to distort, creating [sound waves](#).

The research team suggests the speakers could be used as window or computer screen speakers or even perhaps as a means of damping external noise by running anti-noise waves through them.

Because the process uses readily available materials (the [graphite](#) flakes used to make the ink were simply purchased from a vendor) and is relatively simple and straightforward, it's expected that the resultant speakers would be inexpensive as well, though Jang readily concedes their product isn't ready for prime-time just yet; the sound quality leaves much to be desired, especially the base tones, a problem the team is already hard at work on trying to solve.

**More information:** Flexible and transparent graphene films as acoustic actuator electrodes using inkjet printing, Keun-Young Shin, Jin-Yong Hong and Jyongsik Jang, *Chem. Commun.*, 2011, Advance Article, [DOI:10.1039/C1CC12913A](https://doi.org/10.1039/C1CC12913A)

## Abstract

Flexible and transparent graphene films have been fabricated via inkjet printing and vapor deposition (VDP) methods, and the graphene-based acoustic actuator could be used as an extremely thin and lightweight loudspeaker.

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