



## AT THE MEDICAL FRONTIER

Platinum is part of a breakthrough that could lead to the development of artificial kidneys

Kidney disease can be a serious medical condition, affecting ten per cent of the world population. In the US alone, according to the Centres for Disease Control and Prevention, 37 million people suffer with some form of chronic kidney disease. Of these, about 700,000 people per year will develop end-stage, renal disease, which requires dialysis or, as a last resort, a kidney transplant.

Chemical engineering researchers in the US have recently developed a device that simulates the blood filtering and ion transport functions of the human kidney. The technology could transform treatment options for people in the final stage of renal disease.

Their work involves the creation of a synthetic nephron, the structure in a kidney that regulates blood chemistry by filtering blood to disperse nutrients, including ions, to the body and removing waste material. Chemically, ions are derived from electrolytes such as sodium and potassium, which become ions in solution. The balance of electrolytes in our bodies is essential for the normal function of our cells and organs.

To simulate the filtration process, researchers applied a porous mesh made of platinum to create a 'wafer' that uses an electric field to force ions through membranes. The platinum mesh serves as an electrode when voltage is applied. The mesh electrode allows independent control of transport chambers

within the device, which in turn enables researchers to select different ions and adjust transport rates independently, successfully mimicking the specific control of ion transport by the kidney.

### Platinum's unique properties

Platinum is the 'go to' metal for many medical components and devices, including pacemakers and cochlear implants, due to its unique physical and chemical properties. It is an excellent electrical conductor and, because of its purity, it is also highly biocompatible. This means that platinum is well tolerated by the human body and unlikely to cause an allergic reaction. In addition, platinum is inert and does not corrode inside the body.



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Attempts to make an artificial kidney have been unsuccessful in the past; it is a very challenging and complex area of medicine, as each kidney has more than one million nephrons. However, this latest breakthrough is significant as, for the first time, it creates nano structures that filter the blood in a way similar to biological nephrons.

Researchers believe that their discovery could have the potential to work as a stand-alone device or in conjunction with dialysis, with minor modifications allowing it to function as a wearable, and potentially implantable, artificial kidney.

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