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Developed photoinitiator that is safe for humans and suppresses resin shrinkage, Nanyang Technological University, Singapore

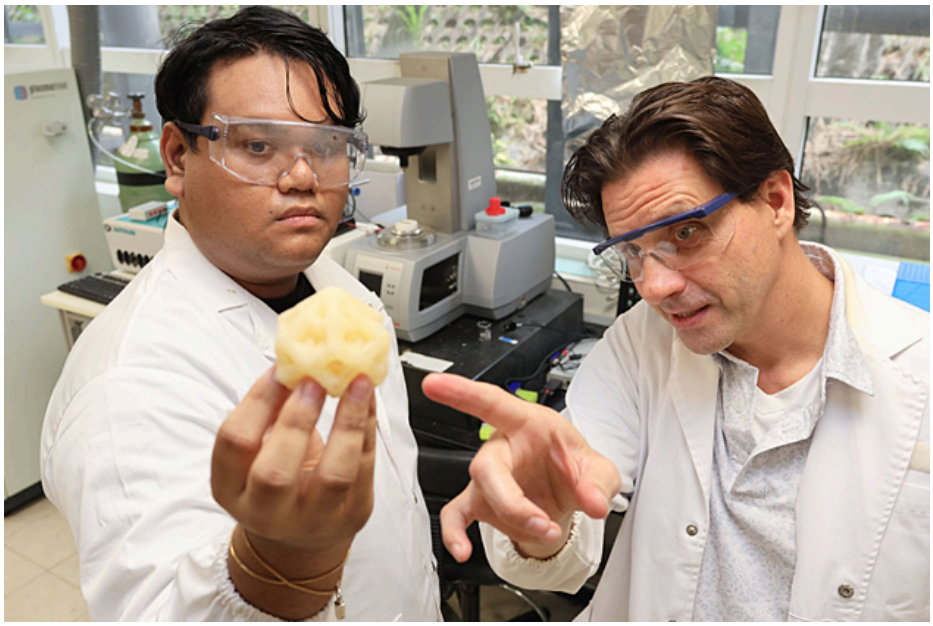
On October 23, Nanyang Technological University (NTU) in Singapore announced that its researchers have developed a new photoinitiator for 3D printing and medical applications that does not exhibit toxicity to human cells, reduces shrinkage during resin curing, and is compatible with sustainable resins from aqueous systems. The research results were published in the academic journal NPG Asia Materials .



Naziruddin Ali, a PhD student (left), and Associate Professor Terry Steele pose with a 3D printed model created using the developed aryldaziline photoinitiator.

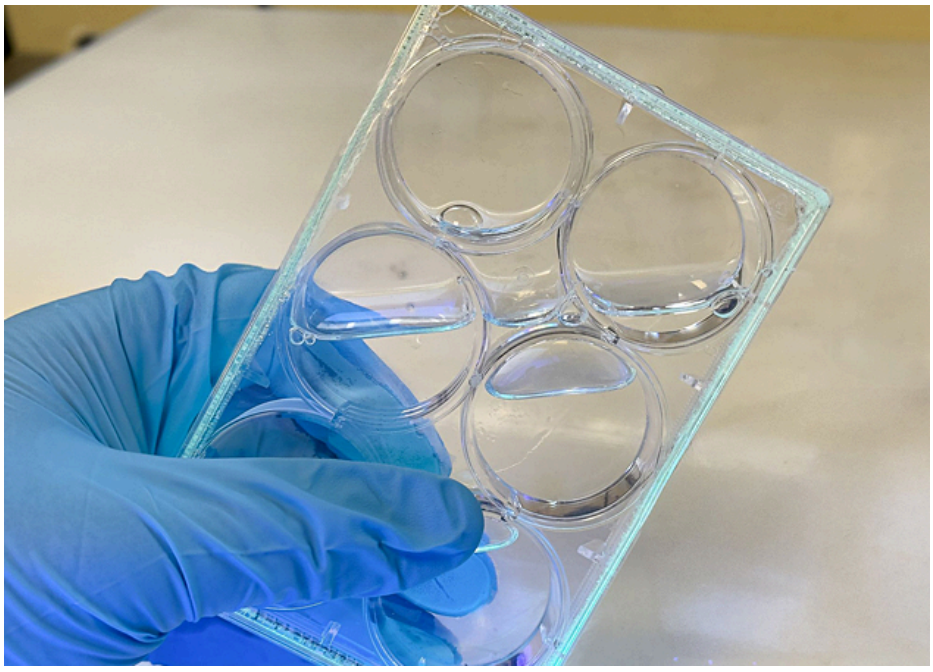
Photoinitiators initiate polymerization reactions when exposed to light, solidifying the liquid material within seconds. It is used in sealing adhesives for electronic devices and biocompatible hydrogels for tissue engineering, but conventional products face challenges such as toxicity and low solubility in water. Widely used photoinitiators have been noted for reproductive toxicity, and safer alternatives are needed.

A team led by Associate Professor Terry W. J. Steele from the NTU Department of Materials Science and Engineering demonstrated that aryldiaziline photoinitiators serve as alternatives with high efficacy and biocompatibility. Aryldiaziline releases nitrogen gas during curing. By adjusting this property to offset resin shrinkage, it leads to a more stable and reliable product. Several of the new compounds are water-soluble, liquid at room temperature, easy to handle, and can be used in biomedical applications that avoid the use of organic solvents. In addition to being non-toxic, he explains that it will also solve the long-standing problem of material shrinkage, which is important in fields requiring high precision such as 3D printing and dentistry.



Naziruddin Ali, a PhD student (left), and Associate Professor Terry Steele discuss a 3D printed model created using the developed aril diazirin photoinitiator.

The research team used sustainable soybean oil-derived resins to fabricate watertight, in-place molding gaskets (FIPG) and 3D-printed microfluidic channels. Additionally, they developed a bioadhesive for skin that can stretch more than 3.5 times its original length without damaging the skin beneath the adhesive surface. This adhesive also functions as a protective barrier for medical catheters intended for long-term placement. The new compound is also promising for encapsulation of live cells and food packaging.



その場成形ガスケット(FIPG)を携帯型の紫外線ライトで瞬時に硬化させ、水密性のあるシールを形成する様子。用途に合わせた封止材や生物医学用機器における、この材料の有用性を示している。
(出典:いずれもNTU)

筆頭著者のナジルディン・アリ(Naziruddin Ali)博士課程学生は「次の段階は、実験室で得られた知見と工業規模の製造との隔たりを埋め、世界のパートナーがこれらの安全な光開始剤を容易に導入できるようにすることです」と述べた。

サイエンスポータルアジアパシフィック編集部

発表論文: Ali et al. (2026) Non-toxic aryl diazirine photoinitiators

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