Bright future for new LED manufacturing process

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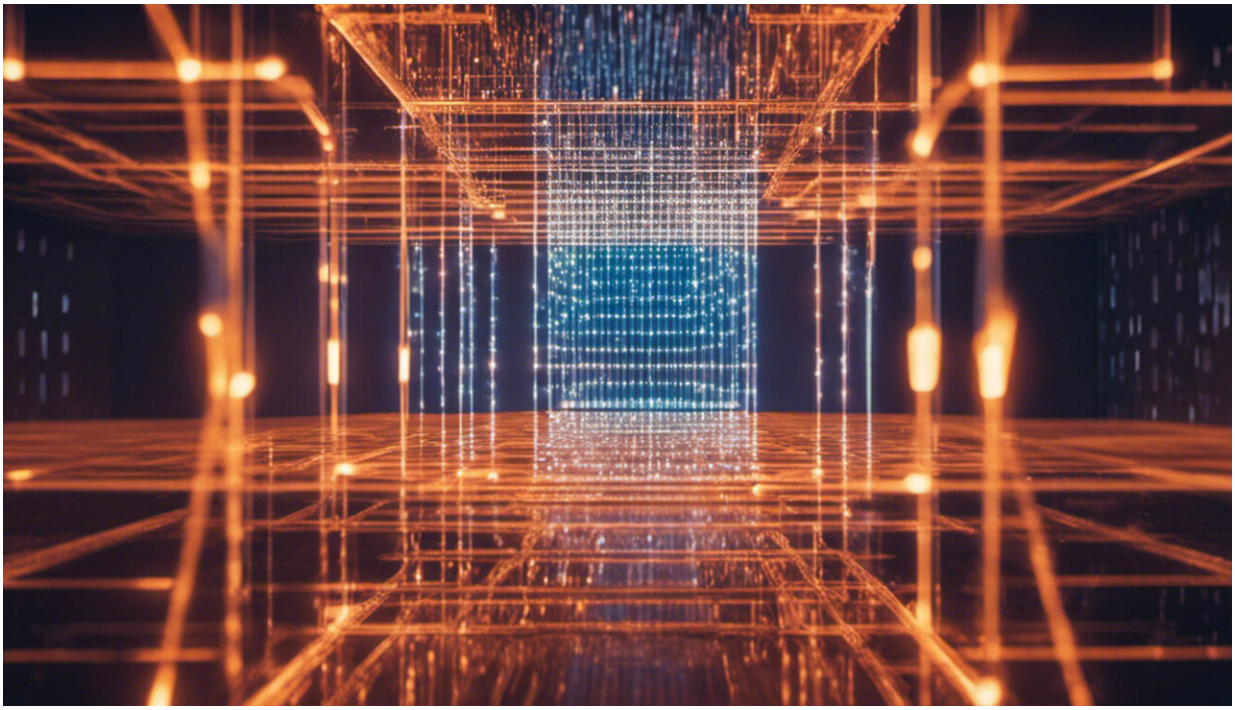

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A new technique for making brighter, longer-lasting LEDs (Light Emitting Diodes) has taken the first leap from research laboratory towards the three-billion-US-dollar global market in high-powered lighting. The new manufacturing system, called liquid forging, dramatically improves the way tiny electronic devices keep cool and

looks set to revolutionize production of next generation LEDs.

Many electronic parts need heat sinks to prevent burnout. Effective cooling of high-powered LEDs for homes, offices and streetlights is a serious engineering challenge for a global market expanding 10% annually. If heat is allowed to build, it can damage parts causing them to dim and lose efficiency. The award-winning liquid-forging method developed by A*STAR's Singapore Institute of Manufacturing Technology (SIMTech) provides a solution.

"Liquid forging is a hybrid between forging and casting," says Chua Beng Wah, the lead researcher on the SIMTech project. "It is especially useful if you need to manufacture lighter components with intricate features like heat sinks using wrought aluminum alloys."

The process provides a significant additional benefit for thermal engineers: the thermal conductivity of liquid-forged products beats conventional techniques such as casting by a factor of two. "The method is ideally suited to heat sink design," adds Beng Wah.

In April this year, A*STAR's technology transfer arm, Exploit Technologies Pte Ltd (ETPL), licensed the patented technology to a leading LED thermal management firm. The agreement allows the firm to build lightweight, high-performance LED heat sinks using the liquid-forging process.

Liquid forging was developed by a SIMTech team led by John Yong. In 2008, Yong's team won Singapore's highest honor for exceptional research, the National Technology Award, for their discovery.

The process is highly scalable allowing complex parts — using composite materials such as copper and aluminum — to be created in a single step. This development means heat sinks and light fixtures can be

formed as one piece significantly minimizing assembly costs. The system also allows more elaborate designs like complex arrays of pins and fins that increase surface area for improved heat dissipation. Furthermore, the final product requires less machining, partly because the process uses raw materials more efficiently. The resultant heat sink can be anodized, improving thermal performance by an additional 10–15%.

But liquid forging is not restricted to cooling LEDs. ETPL's Chief Executive Officer Philip Lim explains, "Liquid forging is a low-cost system with the potential to compete with traditional manufacturing processes in the biomedical, aerospace and automotive industries. Amongst other things, this technique could be used to make alloy wheel trims, electronic casings or pistons."

With products predicted to be on the shelves as early as 2013, the future for this new technology seems bright.

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