Press release

Gross-Umstadt, 26.11.2025

NanoGlue as a key technology for photonics and quantum computing

In modern photonics manufacturing, the precise alignment and permanent fixation of optoelectronic components plays a central role. Especially when assembling laser diodes, waveguides, microoptical components, and photonic chips, nanometer-level accuracy is decisive for coupling losses, service life, and the cost-effectiveness of the systems.

With NanoGlue, nanosystec provides a technologically mature epoxy adhesive system that enables universal and reliable processing of this demanding material. While classic joining methods such as laser and selective soldering require metallic contact surfaces, epoxy bonding allows almost any combination of materials to be joined. “This flexibility offers a decisive advantage in modern hybrid architectures of optical modules, as the joining of optical components in particular is becoming increasingly important in the development of quantum computers,” emphasizes Jan Kallendrusch, CTO of nanosystec GmbH.

Photonic subsystems, optical feeds in cryogenic environments, and hybrid assemblies in particular require not only electrical insulation capability but also long-term dimensional stability over wide temperature ranges. This is precisely where NanoGlue offers significant added value. The system combines active alignment with high-precision epoxy application to first align components for maximum optical performance and then fix them in position with nanometer-level stability. Controlled UV and temperature processes reduce the risk of post-curing positional shifts that could otherwise lead to performance losses. In addition, larger gap dimensions can be compensated for, which lowers the requirements for mechanical pre-precision and reduces manufacturing costs.

Another economic advantage results from the cost-effective modular system technology and the comparatively inexpensive adhesives. Both storage conditions and process times remain easily manageable. In addition, the dosing system allows the adhesive to be applied in the form of dots, lines, or polygonal patterns, so that even complex geometries can be reliably covered. This allows even the smallest quantities down to 5 nl to be applied with precision.

For particularly demanding applications, the adhesive strength can be increased by optional upstream plasma cleaning, which improves the long-term stability of the bonds, even under high humidity, severe temperature fluctuations, or mechanical vibration.
“Unlike metal-based joining technologies, epoxy bonding requires neither additional metallization layers nor absolutely flat contact surfaces. This flexibility makes NanoGlue particularly attractive for photonic assemblies in large or small quantities,” adds Jan Kallendrusch.

NanoGlue thus offers a combination of universal material compatibility, high process precision, reduced mechanical pre-processing, and a convincing cost structure. For further automation, NanoGlue can be easily integrated into existing production lines. Feeding and removal can be carried

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out using conveyor belts, robots, or feeders with JEDEC-format workpiece carriers. Thanks to the modular system architecture, subsequent automation of individual stations is also possible.

In view of increasing optical integration densities and the growing relevance of cryogenic, optoelectronic components, the system marks a key technological step forward. Whether in series production, in R&D laboratories, or in the development of quantum computing infrastructure.

Nanosystec will present its solutions from January 20 to January 22 at booth 3281 at SPIE Photonics West in San Francisco.

About nanosystec:

nanosystec GmbH develops and manufactures high-precision assembly and testing systems for industrial series production. Based in Gross-Umstadt near Darmstadt, the company has been a partner to leading manufacturers in optoelectronics, medical technology, the automotive industry, and aerospace since 2001. The systems are based on finely tuned motion control and integrate processes such as precision laser welding, UV micro-bonding, and fine balancing. Thanks to modular platform architecture and high repeatability in the submicrometer range, both highly flexible and cycle time-optimized production solutions can be realized. In addition to standard modules, nanosystec also offers customized complete solutions including process development, integration, and lifecycle support.

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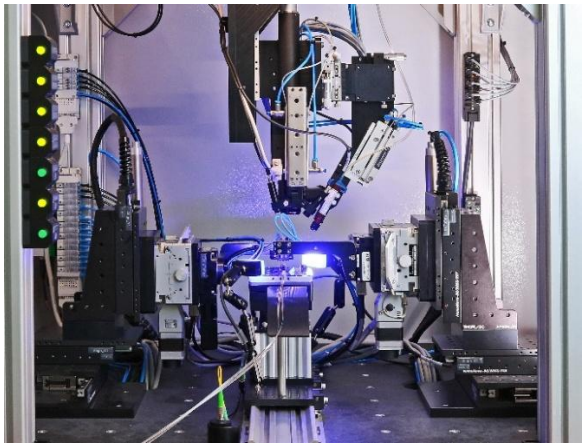
Pictures:



Picture caption:
Active alignment and bonding of cryogenic optoelectronic components with NanoGlue

Deeplinks:
NanoGlue

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