



Photonic Curing & Selective Photoheating

Adhesive & Bonding Expo || 04. December 2024

COMPANY INTRODUCTION

- IonoQure Ltd. was founded in Ireland during 2021 as an engineering company
- Decades of experience in automotive, consumer electronics, displays and optical materials, strong expertise in adhesives, UV-curing electronics
- Actual home is in Cork/ Ireland
- 2024 opening of a new Photonics Center and a Logistics Hub in Thermi/ Greece
- Sales & marketing activities through associates in Europe, NA, APAC



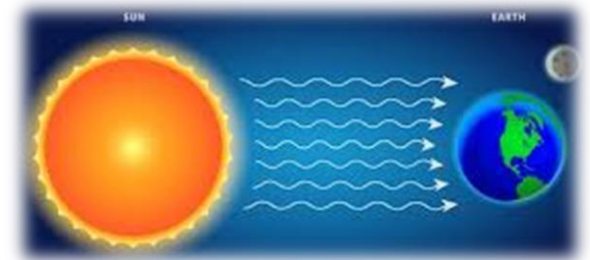
EXPERTISE & COMPETENCE AREAS

- IonoQure Ltd activities and main expertise and competence areas are divided in:
 1. Photonics, Electronics, Nanotechnology
 2. Research, Technology Development, Inno (RTDI)
 3. Adhesives and coatings



PHOTOHEATING, NATURE STANDS AS A MODEL

- One of the most common examples of Photoheating is solar heating of the Earth's surface.
- Sunlight contains a wide range of wavelengths
- These rays are absorbed by various objects, such as land, water, and buildings.
 - The result is the conversion of the absorbed energy into heat and a rise in temperature.
- On the Moon surface the radiative thermal excursion between light and dark is of 300°C (sunlight 127°C; shadow -173°C)



PRINCIPLE AND INTRODUCTION

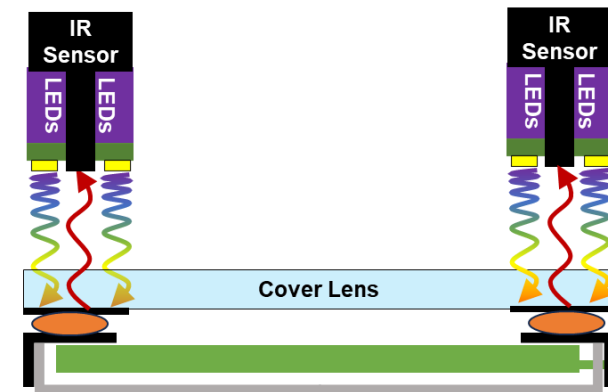
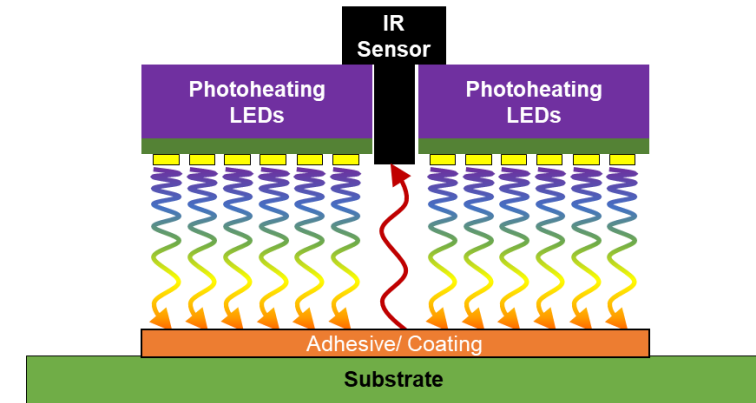
- IonoQure Selective Photoheating and general Photonic Curing are innovative photonic techniques that address the challenge of cost-optimized manufacturing of complex optical and electronic devices.
- Photoheating, as the name suggests, is the heating of a material due to the absorption of light.
- When light interacts with matter, it transfers energy to the atoms or molecules, increasing their kinetic energy and, consequently, the temperature of the material.
- This energy transfer occurs through the absorption of photons, which are wavelets of light particles.



MODES OF OPERATION

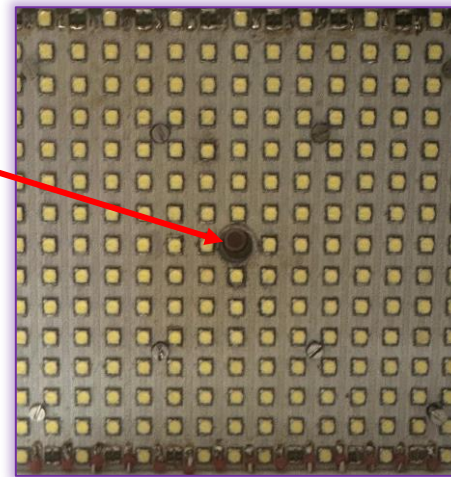
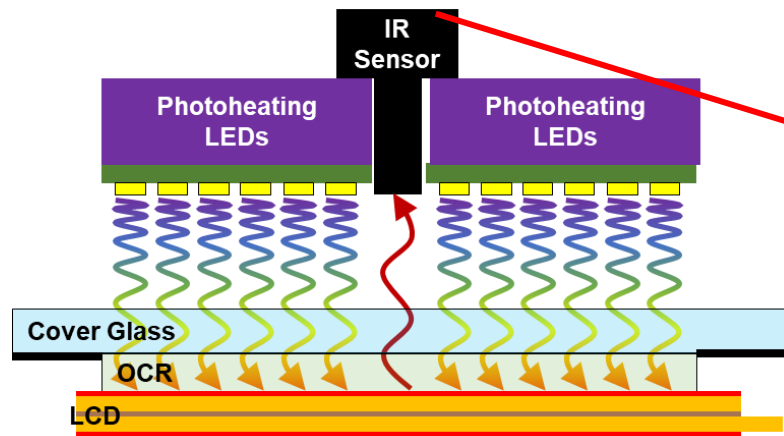
- Photoheating operates in two ways:

1. By direct exposure of adhesives/coatings.
2. The adhesive is heated indirectly by irradiating the substrate in direct contact with the adhesive (e.g. under the substrate).

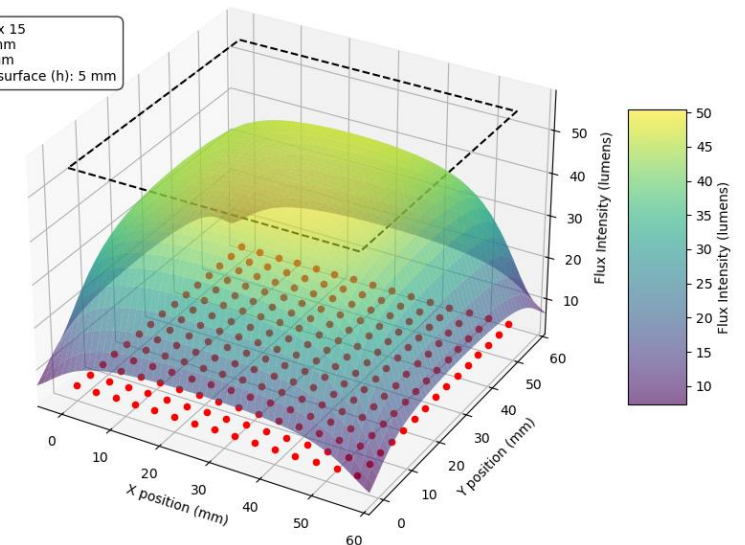


EQUIPMENT FEATURES IN BRIEF

- Selective Photoheating uses LEDs to emit a specific electromagnetic spectrum, while built-in IR sensors monitor the temperature.
- Schematic of Photoheating principle in a display optical bonding application with silicone OCR is illustrated below:



Array Size: 15 x 15
X-distance: 4 mm
Y-distance: 4 mm
Distance from surface (h): 5 mm

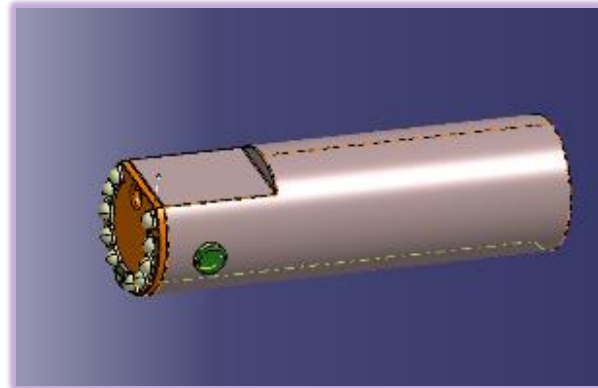


- It quickly raises the temperature to a specific target and maintains it within set upper and lower limits for a predetermined time.



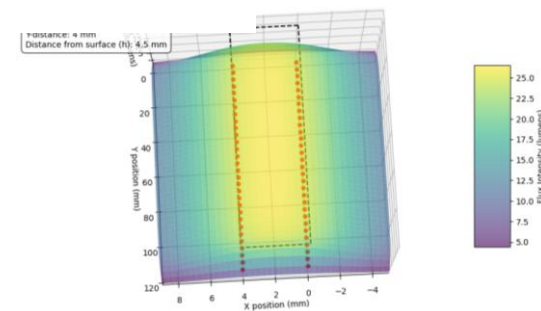
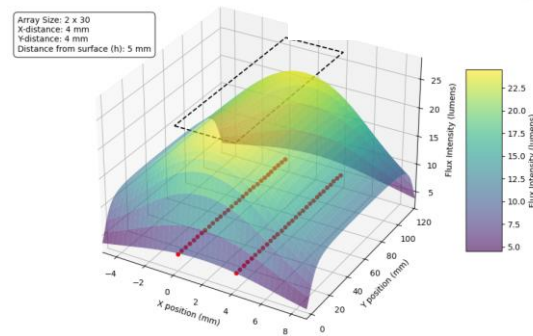
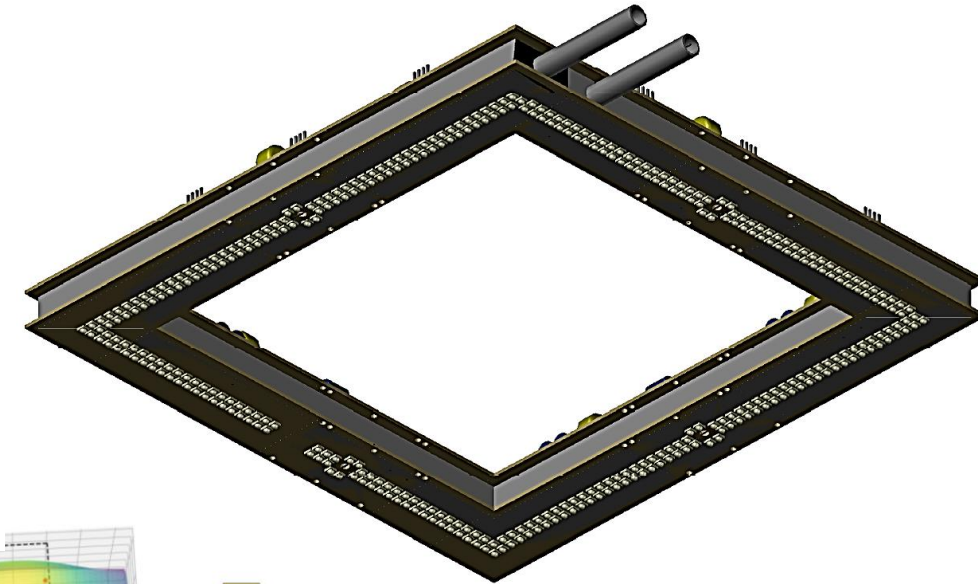
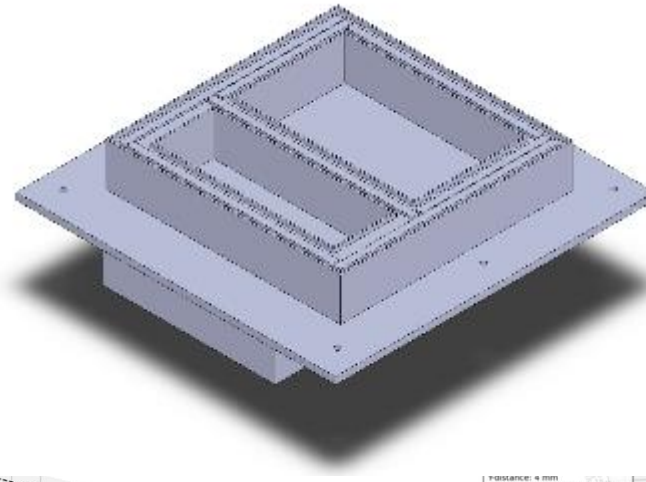
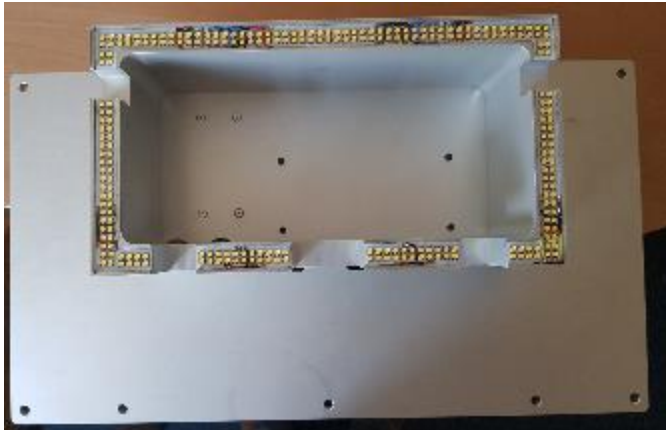
CASE HISTORY PHOTOHEATING

- The LEDs used for these devices will follow certain contours and as such we can accurately define the areas where (and how much) heat is generated or not.
- Following some examples of Selective Photoheating devices used for curing adhesives in display applications (perimeter, haptic actuator, or optical bonding).



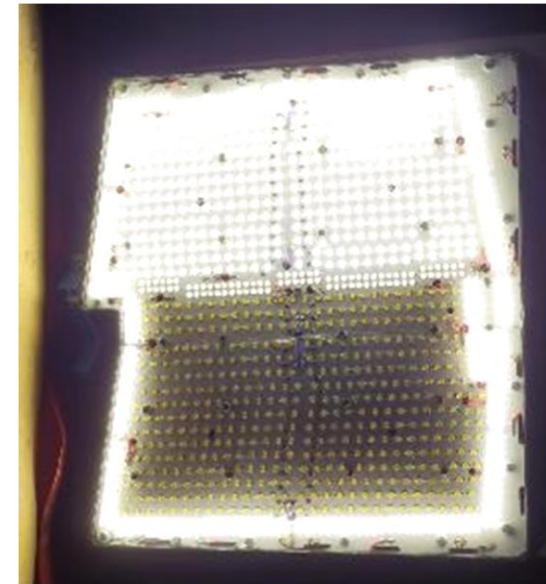
CASE HISTORY PHOTOHEATING

- Perimeter bonding/ structural bonding of cover lenses to housing in automotive and consumer electronic display applications.



CASE HISTORY PHOTOHEATING

- Perimeter bonding/ structural bonding of cover lenses to housing combined with optical bonding in automotive display application.



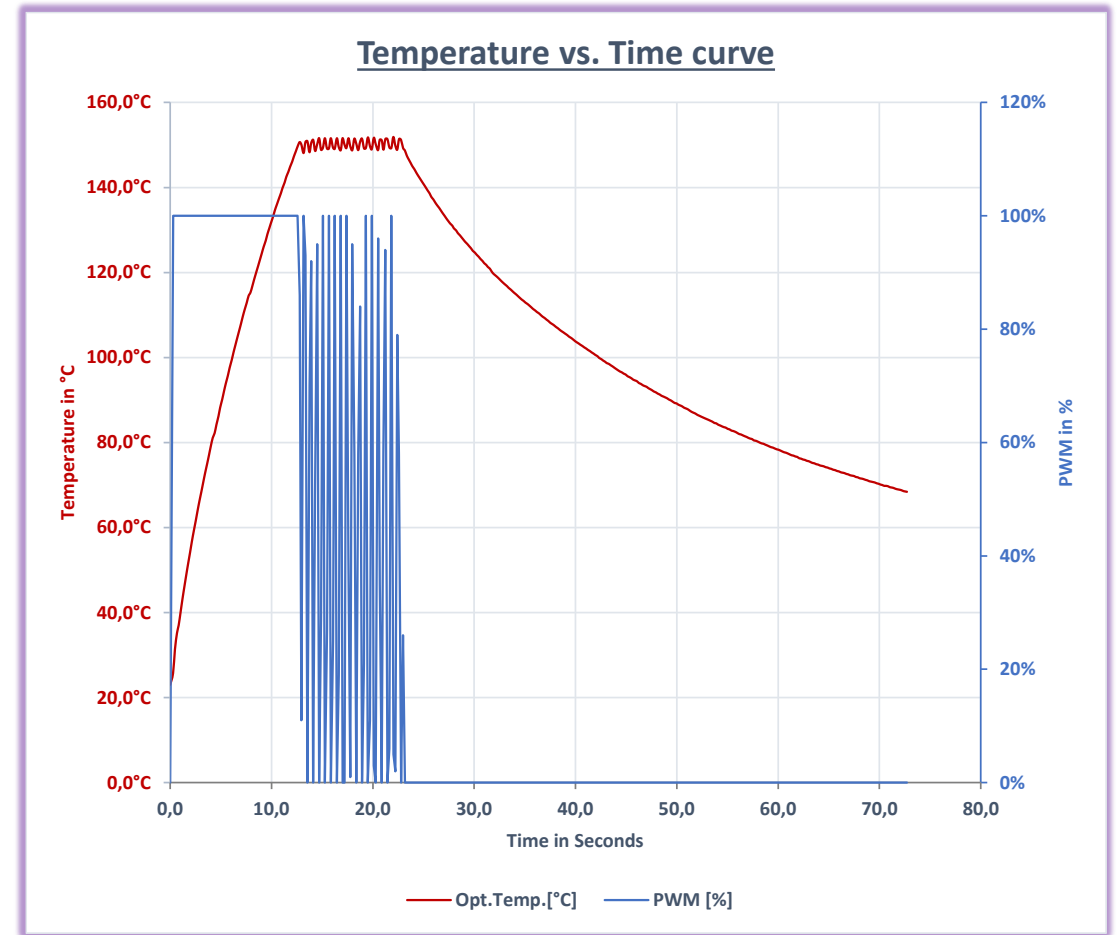
FEATURES AND DESIGN OPTIONS

- Device design can conform to specific shapes, and we can precisely determine which areas are heated and which are not.
- Precise monitoring and control of substrate and adhesive temperature is accomplished using integrated temperature and optical IR sensors (*) see examples on next slides
- The temperature range is dependent of the adhesive used and substrates.
 - Typically, will be between 70°C to 150°C.
 - It can achieve temperatures as high as 200°C.
- Technique is suitable for all glass, plastics and especially thermosensitive materials



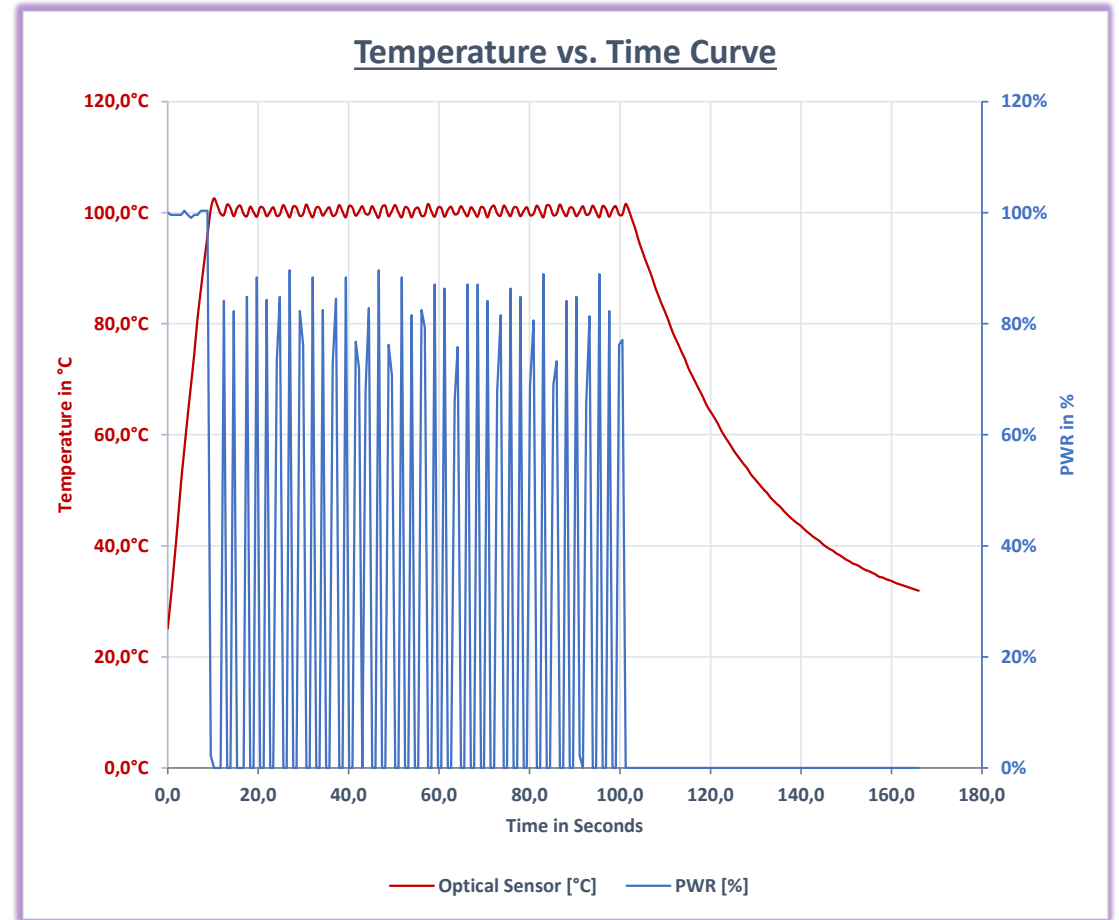
(*) PROCESS MONITORING EXAMPLE

- High-speed curing systems with accurate process monitoring...
- The graph shows a servomotor encapsulation with an epoxy resin
 - Adhesive set temperature of 150°C was reached in 12 seconds
 - Keep time 10 seconds



(*) PROCESS MONITORING EXAMPLE

- High-speed curing systems with accurate process monitoring...
- The graph shows a display frame bonding with a silicone
 - Adhesive set temperature of 100°C was reached in 9 seconds
 - Keep time 60 seconds



APPLICATION AREAS

- Photoheating and Photonic Curing have numerous applications in various scientific and technological fields like:
 - Selective photothermal annealing
 - Various biomedical applications, such as photothermal therapy
 - Precise and effective drying, curing, sintering of printed electronic inks, coatings
 - Adhesives Bonding/ Debonding in combination with all types of substrates or thermosensitive materials
 - Wafer temporary Bonding/ Debonding



SUMMARY

- IonoQure has developed innovative bonding processes that address the challenge of cost-optimized manufacturing of complex optical devices and large displays.



- The Selective Photoheating for photothermal materials is a new photonic technique resulting from collaboration with technology partners to precisely and effectively cure optical and structural adhesives in different applications, suitable for bonding all types of glass and plastic substrates.



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