

NEW TECHNOLOGIES FOR BOTH INTERIOR COMFORT AND THERMAL EFFICIENCY

Hyundai Motor Company and Kia Corporation have unveiled new technologies designed to closely regulate vehicle interior temperature, during a “Heat Tech Day” held in Seoul, South Korea, showcasing research and development achievements in temperature control, a crucial aspect of passenger comfort, while also allowing efficient management of vehicle energy in the era of electrification. The three technologies are:

- **NANO COOLING FILM** lowers interior temperatures by over 12°C (more than 21.6°F) in hot weather when applied to vehicle glass, to significantly improve in-vehicle conditions and reduce cabin cooling needs;

Nano Cooling Film comprises three layers—two that reflect solar energy and one that emits mid-infrared wavelength. It not only blocks infra-red radiation from outside the vehicle, like traditional tinting films, but also allows heat to escape from inside the vehicle. Bonus: it can be used with existing tinting films without further impacting light transmission.

During testing, Hyundai and Kia each prepared multiple vehicles, applying Nano Cooling Film to one and leaving the other in its original state. Vehicles

with regular glass and not equipped with Nano Cooling Film recorded an interior temperature of 48.5°C (119.3°F), compared with 36.0°C (96.8°F) for the vehicles fitted with Nano Cooling Film, demonstrating a maximum temperature reduction of 12.5°C (22.5°F) with the advanced technology applied.

- **RADIANT HEATING SYSTEM** quickly and efficiently raises the perceived temperature around passengers in cold weather, enhancing comfort while extending vehicle driving range; and

The underfloor Radiant Heating System uses a heating element that emits radiant heat towards passengers’ legs, quickly warming them during cold weather. The system comprises a high-temperature film-type heating element and a burn prevention system. The heating element, which can reach 110°C (230°F), is wrapped in a fabric material that emits infra-red rays and adjusts the heat to a comfortable level. A burn prevention system detects body contact and immediately lowers the temperature, improving safety by eliminating burn risks.

On Kia’s Radiant Heating System-equipped EV9, nine heating panels are installed, including on the steering column base, driver’s door and center console, as well as the passenger door and glove box base. Alongside the vehicle’s existing heating system, the Radiant Heating System could conserve up to 17 percent more energy to reach a desired comfort, also saving time to reach this condition—the system delivers warmth to the lower body within three minutes. Adding the Radiant Heating System is expected to significantly

extend driving range of electric vehicles (EVs) in winter by reducing energy used for climate control.

- **METAL-COATED HEATED GLASS** uses a world-first 48V system to quickly transmit heat from an electrically powered metal coating on the glass, removing frost and moisture, for fast and energy-efficient window defrosting, improved visibility and therefore increased safety compared with regular tungsten wire heating elements.

Metal-Coated Heated Glass is invisible, providing a clear, undistorted view for occupants.

The 48V system can completely defrost a glass surface within five minutes at -18°C (0.4°F), up to four times faster, and consuming around 10 percent less energy, than conventional HVAC systems.

Additionally, on hot days, the metal coating can passively block at least 60 percent of solar energy, reducing cabin cooling requirement to significantly improve energy efficiency.

All three technologies are at the level of technological maturity suitable for mass production. Hyundai Motor and Kia have applied for patents in major domestic and foreign markets, with plans to implement the technologies in future vehicles. ■

