and a transfer yield approaching 99%.

The team also constructed a finite element theoretical model of the graphene actuator and calculated a coefficient of thermal expansion of $(6.9 \pm 0.6) \times 10^{-6}$ per °C.

To compare both theoretical and experimental results, the researchers investigated the effect of temperature as a function of input power. The team determined that the temperature of the cantilever changed linearly to 36°C with a supplied power up to 1.26 mW. The deflection of the cantilever increased linearly with temperature or the electrical input power resulting to conversion factors of 0.17 μm/°C and 2.58 μm/mW. These values are in agreement with theoretical values. The oscillation of the beam with a frequency of 0.91 Hz are observed.

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**Phosphor thermometry provides non-contact temperature measurements by analyzing the changes of photoluminescence (lifetime decay or intensity ratios) with temperature.** Compared with other noncontact temperature measurements, phosphor thermometry is a low-cost technique and provides simple diagnostics, enabling its use in nonplane geometries and in fluids. N. Ishiwada, T. Ueda, and T. Yokomori from the Keio University, Japan have investigated the photoluminescence response to the temperature of Tb³⁺/Tm³⁺ co-doped Y₂O₃ phosphors, finding that these materials show a clear intensity ratio response even at high temperatures, not suffering from strong thermal quenching. The researchers have shown that these materials present intensities of two emission lines with different responses to temperature, an emission intensity strong enough to avoid optical noise, and emission of blue or green light, where black-body radiation is relatively weak. The results of this study appeared in the March 1st issue of *Optics Letters* (DOI: 10.1364/OL.36.000760; p. 760). The researchers prepared Y₂O₃:Tb³⁺, Y₂O₃:Tm³⁺, and Y₂O₃:Tb³⁺/Tm³⁺ phosphors by a flame spray synthesis method. They dissolved Y(NO₃)₃·6H₂O, Tb(NO₃)₃·6H₂O and Tm(NO₃)₃·6H₂O in distilled water to prepare a 0.3 M precursor solution that was supplied, together with methane and oxygen gases, to the co-axial burner to form a high-temperature diffusion flame where monoclinic Y₂O₃ could be crystallized.

The researchers also investigated the temperature-sensitive visible photoluminescence of Yb₂O₃:Tb³⁺/Tm³⁺ as a function of dopant concentration. They observed visible photoluminescence color changes from green to blue with increasing temperature for specific dopant concentration (see Figure). The researchers said this property suggests the possibility of measuring the temperature not only by analyzing the intensity ratio but also by observing the color change visually through a visual thermo-sensor (VTS).

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