

## Highly Transparent, Flexible, and Self-Healable Thermoacoustic Loudspeakers

강동희, 고현협<sup>†</sup>, 조승세, 이해진, 최아영, 염정희, 김민수,  
노승만<sup>1</sup>, 성수진<sup>1</sup>, 김진철<sup>1</sup>  
울산과학기술원; <sup>1</sup>한국화학연구원  
(hyunhko@unist.ac.kr<sup>†</sup>)

Thermoacoustic (TA) loudspeakers have garnered significant attention as a novel film speaker that utilizes temperature oscillation to vibrate the surrounding air. Conventional film-type TA loudspeakers are known to experience problems when their conductive networks are damaged, causing their malfunction. Therefore, introducing self-healing polymers in TA loudspeakers could be an effective way of restoring the surface damages. In this study, we present transparent, flexible, and self-healable TA loudspeakers based on silver nanowire(AgNW)-poly(urethane-hindered urea)(PUHU) conductive electrodes. Our self-healable AgNW/PUHU electrodes exhibit significant self-healing for repairing the surface damages that are caused due to the dynamic reconstruction of reversible bulky urea bonds in PUHU. In particular, the TA speakers are able to recover the original sound after healing the surface damages within 5 min. We believe that the technique proposed in this study provides a robust and powerful platform for the fabrication of transparent and flexible TA loudspeakers with excellent self-healing, which can be applied in flexible and wearable acoustic electronics.