

# Structural Self-Sensing Provided by Measuring the Resistance, Capacitance or Inductance of the Structural Material, Without Sensor Incorporation

## Speaker

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#### Abstract

Structural self-sensing refers to a structural material sensing its own condition without sensor incorporation. Compared to sensor incorporation, advantages include low cost, high durability, large sensing volume and the mechanical properties being not degraded. The self-sensing ability makes the structural material multifunctional. Structural self-sensing involving resistance measurement has been studied for decades, but recent work by the speaker has extended it from resistance measurement to capacitance or inductance measurement. Resistance or inductance measurement is applicable only to conductive materials. However, capacitance measurement is broadly applicable to both conductive and nonconductive materials. The dielectric behavior of nonconductive materials is well-known, but that of conductive materials involves new science, which hinges on the interaction of a small fraction of the charge carriers with the atoms, particularly those that are at heterogeneities. The effect of strain or damage on the resistivity is the basis of strong resistance-based sensing. The effect of strain or damage on the permittivity is the main basis of strong capacitance-based sensing. The effect of the electrical connectivity, surface roughening or shape change on the inductance is the main basis of inductance-based sensing.

#### Biography

Chung is SUNY Distinguished Professor (President's Medalist) in the State University of New York (SUNY, Buffalo). She received Ph.D. degree in Materials Science from Massachusetts Institute of Technology, and B.S. degree from California Institute of Technology (being the first female engineering graduate of this university). She is a pioneer and international leader in the field of multifunctional structural materials. She has authored or coauthored over 600 archival journal papers and 10 books. Chung is Member of American Academy of Arts and Sciences, Fellow of ASM International, and Fellow of American Carbon Society. She also received the Pettinos' Award from American Carbon Society and Honorary Doctorate from University of Alicante, Spain. The 2022 study of Stanford University ranked Professor Chung 13th among 315,721 materials researchers in the world (living and deceased), 10th among those that are living, and 1st among those who are female.



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