



## Harvesting Energy from Asphalt Pavements under Moving Load Using Imbedded Piezoelectric Patches

Yisheng Chen\*, Yangyang Zhang, Chaofeng Lu

\* *Presenting Author*

*Corresponding Author: Chaofeng Lu*  
*Contact Email: lucf@zju.edu.cn*

### ABSTRACT

To ensure highway traffic safety especially during night and in the tunnels, auxiliary road facilities including road lighting and directions systems are of a large command to keep long-term operation, thus resulting in enormous consumption of power. Roadway advertisement systems also contribute to this effect. Here, we propose to implant within the asphalt pavement arrays of piezoelectric patches that can transform the mechanical deformation of the pavement caused by the traffic load into electricity.

For the asphalt pavement with imbedded PZT bimorph, the electromechanical coupling behavior is modeled as a plane strain problem based on the theory of piezo-elasticity in this paper.

The results for the waveform of output voltage in one individual energy storage circuit agree well with the experiment measurements based on the rutting test. The theoretical predictions indicate that the output power of the piezoelectric energy harvester depends on the geometry, imbedded depth, material properties, and resistance etc. The output power can achieve a maximum while the resistance approaches the intrinsic impedance of the device. The results may effectively support the design of the structure parameters and circuit in the practical pavement with energy harvesting system.

**KEYWORDS:** *asphalt pavement; piezoelectric energy harvester; intrinsic impedance; piezo-elasticity*