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Application of piezoelectric transducer in energy harvesting in pavement

Xiaochen Xu¹, Dongwei Cao^{2*}, Hailu Yang³, Ming He⁴

¹ Research institute of highway ministry of transport, Beijing 100000, Ph (010) 62027640, 542656098@qq.com;

^{2*}Corresponding author, Research institute of highway ministry of transport, Beijing 100000, Ph (010) 62027640, caodongwei@vip.126.com;

³ Research institute of highway ministry of transport, Beijing 100000; 727930305@qq.com

⁴ Research institute of highway ministry of transport, Beijing 100000; hemin307@163.com

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Abstract: Mechanical energy appears everywhere in the nature, road vibration energy created by the vehicle will not only do damage to pavement structure, but also is difficult to collect. Utilizing electromechanical conversion characteristics of piezoelectric material, gather the vibration energy when vehicle passing on the pavement, and design the piezoelectric transducer package box, for traffic lights along the roads, signs, and so on. Save the cost of laying long distance transmission line, also take full advantage of the loss of energy. Experiments of piezoelectric boxes has been conducted in pavement to prove the effectiveness of this product. This study shows that utilize piezoelectric technology in road energy harvesting is feasible and has a bright future.

Keywords: Road Engineering; piezoelectric transducer package; energy harvesting; clean energy

Objective

With the social and economic development, along with the continued depletion of fossil energy, declining environmental quality, combined with our sustainable development strategy, how to efficiently collect and facilitate clean energy has been the focus of energy research. Road as a national critical infrastructure, undertakes the transportation of people, goods, and other important functions. On the road, millions of vehicles generate vibration on the roads, which is very considerable, vehicle vibration can not only cause damage to road, but also lead to a waste of energy. How to collect vibration energy, turning it into the energy available for people to use is the problem that need to be solved. At present, based on the conversion mechanism, collecting environmental vibration energy devices can be divided into three types: electromagnetic, piezoelectric and electrostatic.

Piezoelectric energy harvesting technology utilize the characteristic of electromechanical coupling of piezoelectric materials, directly convert mechanical energy to electrical energy, compared to electromagnetic and electrostatic generating, piezoelectric power generation with original small size, does not need an external power supply-driven and so on. Based on these advantages, the piezoelectric technology has developed rapidly, but most piezoelectric devices are used to collect fixed mechanical equipment vibration energy, tidal and wind

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