Smart Colloidal Dampers with Controllable Damping Curves Using Magnetic Field

Tech ID: 18755 / UC Case 2007-297-0

BACKGROUND

Current dampers with controllable damping curves, e.g., magnetorheological fluid (MRF) dampers, are primarily hydraulic dampers, which are based on viscous flow through orifices. The viscous-flow dissipates energy by the internal friction mechanism of the fluid, converting external energy to thermal energy totally. However, increased temperature degenerates the damping efficiency of dampers through decreasing the viscosity of the fluid. The damper efficiency is defined as the ratio between the dissipated energy during its cycle and the absorbed energy during the loading phase of the cycle.

For commercial hydraulic dampers, the rod should have sufficient cross area to transfer damping forces and therefore, the efficiency for current hydraulic dampers can hardly exceed 50%. Though nanoflow dampers were introduced recently as low-heat generation and high damping efficiency devices, they do not possess on-demand controllable damping curves. Therefore, smart dampers based on a nanoflow damping mechanism to provide low heat generation, high damper efficiency, and on-demand controllable damping curves are very rare and its development would be of great importance for adaptive vibration control and suspension systems.

TECHNOLOGY DESCRIPTION

University researchers have developed a novel type of colloidal damping media with on-demand controllable loss-factor. The proposed smart colloidal dampers compared to existing smart dampers have the following merits: (1) low heat generation and high damping efficiency; (2) high dynamic range (up to 30Hz, which is 6 times wider compared to current smart dampers); (3) wide range of on-demand shiftable damping curves (can be shifted more than 10 times) and (4) compact size and light weight. Combined with the current best-available electrical control circuits and appropriate control strategies, suspension systems by utilizing the proposed dampers are expected to yield exceptional vibration mitigation performance.

APPLICATIONS

Potential applications of the dampers with on-demand controllable damping curves are: adaptable vibration reduction and NVH (noise, vibration and harness) improvements of high performance vehicles, adaptive vibration control for seismic protection of civil structures, vibration control of apparatus, or vibration control of aero-structures.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	8,317,002	11/27/2012	2007-297

CONTACT

Edward Hsieh
hsiehe5@uci.edu
tel: 949-824-8428.

OTHER INFORMATION

CATEGORIZED AS

- **Nanotechnology**
  - Other
- **Engineering**
  - Other

RELATED CASES

2007-297-0

UCI Beall
Applied Innovation

5270 California Avenue / Irvine,CA
92697-7700 / Tel: 949.824.2683