145
Accession number:20121414931176
Title:Novel Nondestructive Imaging Analysis for Catalyst Washcoat Loading and DPF Soot Distribution Using Terahertz Wave Computed Tomography
Authors:Nishina, Shigeki (1); Takeuchi, Kunio (1); Shinohara, Makoto (1); Imamura, Motoki (1); Shibata, Masahito (2); Hashimoto, Yoshihito (2); Watanabe, Futoshi (2)
Author affiliation:(1) Advantest Corp, Japan; (2) Johnson Matthey Japan, Inc, Japan
Corresponding author:Nishina, S.(shigeki.nishina@jp.advantest.com)
Source title:SAE International Journal of Fuels and Lubricants
Abbreviated source title:SAE Int. J. Fuels Lubr.
Volume:5
Issue:1
Issue date:January 2012
Publication year:2012
Report number:2011-01-2064
Pages:343-351
Language:English
ISSN:19463952
E-ISSN:19463960
Document type:Journal article (JA)
Publisher:SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, United States
Abstract:This paper describes a three-dimensional (3D) visualization framework using terahertz (THz) waves for quantitative analysis of the distribution of catalyst washcoat loading and diesel particulate filter (DPF) soot deposits. THz waves, which are electromagnetic waves located between infrared and microwave in the electromagnetic spectrum, have good directivity and moderate resolution. Accordingly, a computed tomography (CT) technique has been developed to image the interior of an object using the spectral information of THz waves. This THz wave CT technique can be used to analyze the interior of various target objects, and has good penetrability of ceramic substances used as catalysts in automobiles. Against this background, a method using THz CT for nondestructive analysis of catalyst washcoat loading and the density distribution of soot was developed, and this framework was evaluated. In order to estimate the quantitative measurement capability for nondestructive analysis of catalyst washcoat loading, a DPF sample with a change induced in the density distribution, and with soot that masks the created catalyst washcoat layer, was analyzed using the new approach of THz wave CT technique. In addition, the catalyst washcoat loading distribution was observed using nondestructive 3D visualization. Further, the soot density distribution of the DPF was also visualized and the analysis result satisfied the sample specification that was pre-determined by other methods. These results imply that the 3D imaging analysis method using THz wave CT can be applied to the nondestructive analysis of catalysts and DPF after-treatment systems. 
Number of references:18
Main heading:Loading
Controlled terms:Catalysts - Computerized tomography - Dust - Electromagnetic waves - Soot -

Terahertz waves - Three dimensional - Three dimensional computer graphics - Visualization
Uncontrolled terms:3D imaging - 3D Visualization - After-treatment - Analysis results - Computed Tomography - CT technique - Density distributions - Diesel particulate filters - Directivity - Electromagnetic spectra - Loading distribution - Moderate resolution - Non destructive - Nondestructive imaging - Quantitative measurement - Soot deposits - Spectral information - Target object - Three dimensional (3D) visualization - THz waves - Wash-coat layer - Washcoats
Classification code:902.1 Engineering Graphics - 804 Chemical Products Generally - 803 Chemical Agents and Basic Industrial Chemicals - 801 Chemistry - 723.5 Computer Applications - 711 Electromagnetic Waves - 672 Naval Vessels - 531 Metallurgy and Metallography - 451.1 Air Pollution Sources
DOI:10.4271/2011-01-2064
Database:Compendex