

Nanomechanical IR spectroscopy for fast analysis of liquid-dispersed engineered nanomaterials - DTU Orbit (08/11/2017)

Nanomechanical IR spectroscopy for fast analysis of liquid-dispersed engineered nanomaterials

The proliferated use of engineered nanomaterials (ENMs), e.g. in nanomedicine, calls for novel techniques allowing for fast and sensitive analysis of minute samples. Here we present nanomechanical IR spectroscopy (NAM-IR) for chemical analysis of picograms of ENMs. ENMs are nebulized directly from dispersion and efficiently collected on nanomechanical string resonators through a non-diffusion limited sampling method. Even very small amounts of sample can convert absorbed IR light into a measurable frequency detuning of the string through photothermal heating. An IR absorption spectrum is thus readily obtained by recording this detuning of the resonator over a range of IR wavelengths. Results recorded using NAM-IR agree well with corresponding results obtained through ATR-FTIR, and remarkably, measurement including sample preparation takes only a few minutes, compared to ~2 days sample preparation for ATR-FTIR. Resonator dimensions play an important role in NAM-IR, a relationship which will be elaborated here.

General information

State: Published

Organisations: Department of Micro- and Nanotechnology, Nanoprobes, Colloids and Biological Interfaces, Center for Intelligent Drug Delivery and Sensing Using Microcontainers and Nanomechanics

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Number of pages: 7

Pages: 667-673

Publication date: 2016

Main Research Area: Technical/natural sciences

Publication information

Journal: Sensors and Actuators B: Chemical

Volume: 233

ISSN (Print): 0925-4005

Ratings:

BFI (2017): BFI-level 1

Web of Science (2017): Indexed yes

BFI (2016): BFI-level 1

Scopus rating (2016): CiteScore 5.07 SJR 1.333 SNIP 1.463

Web of Science (2016): Indexed yes

BFI (2015): BFI-level 1

Scopus rating (2015): SJR 1.25 SNIP 1.509 CiteScore 4.84

Web of Science (2015): Indexed yes

BFI (2014): BFI-level 1

Scopus rating (2014): SJR 1.229 SNIP 1.679 CiteScore 4.37

Web of Science (2014): Indexed yes

BFI (2013): BFI-level 1

Scopus rating (2013): SJR 1.242 SNIP 1.622 CiteScore 4.25

ISI indexed (2013): ISI indexed yes

Web of Science (2013): Indexed yes

BFI (2012): BFI-level 1

Scopus rating (2012): SJR 1.405 SNIP 1.679 CiteScore 3.92

ISI indexed (2012): ISI indexed yes

Web of Science (2012): Indexed yes

BFI (2011): BFI-level 1

Scopus rating (2011): SJR 1.474 SNIP 1.744 CiteScore 4.08

ISI indexed (2011): ISI indexed yes

Web of Science (2011): Indexed yes

BFI (2010): BFI-level 1

Scopus rating (2010): SJR 1.409 SNIP 1.437

Web of Science (2010): Indexed yes

BFI (2009): BFI-level 1

Scopus rating (2009): SJR 1.297 SNIP 1.509

Web of Science (2009): Indexed yes

BFI (2008): BFI-level 1

Scopus rating (2008): SJR 1.436 SNIP 1.576

Web of Science (2008): Indexed yes

Scopus rating (2007): SJR 1.434 SNIP 1.592

Scopus rating (2006): SJR 1.336 SNIP 1.526

Scopus rating (2005): SJR 1.267 SNIP 1.849

Web of Science (2005): Indexed yes

Scopus rating (2004): SJR 1.336 SNIP 1.504

Web of Science (2004): Indexed yes

Scopus rating (2003): SJR 1.159 SNIP 1.381

Web of Science (2003): Indexed yes

Scopus rating (2002): SJR 1.086 SNIP 1.07

Scopus rating (2001): SJR 0.835 SNIP 1.128

Web of Science (2001): Indexed yes

Scopus rating (2000): SJR 0.928 SNIP 1.2

Web of Science (2000): Indexed yes

Scopus rating (1999): SJR 0.907 SNIP 1.07

Original language: English

IR spectroscopy, Nanomechanics, Chemical analysis, Nanomaterials

Electronic versions:

Sensors_and_Actuators_B_2016.pdf

DOIs:

10.1016/j.snb.2016.04.002

Source: FindIt

Source-ID: 2303587976

Publication: Research - peer-review › Journal article – Annual report year: 2016