Life Sciences Reporting Summary

Nature Research wishes to improve the reproducibility of the work that we publish. This form is intended for publication with all accepted life science papers and provides structure for consistency and transparency in reporting. Every life science submission will use this form; some list items might not apply to an individual manuscript, but all fields must be completed for clarity.

For further information on the points included in this form, see Reporting Life Sciences Research. For further information on Nature Research policies, including our data availability policy, see Authors & Referees and the Editorial Policy Checklist.

1. Sample size
   Describe how sample size was determined.

2. Data exclusions
   Describe any data exclusions. No data were excluded from the analyses.

3. Replication
   Describe whether the experimental findings were reliably reproduced.
   The method was applied in various experiments. Multiple experiments were repeated with similar results as reported in the Methods and figure legends.

4. Randomization
   Describe how samples/organisms/participants were allocated into experimental groups.
   This is not relevant for the method, because it doesn't depend on the statistical variation of the sample properties.

5. Blinding
   Describe whether the investigators were blinded to group allocation during data collection and/or analysis.
   This is not relevant for the method, because it doesn't depend on the statistical variation of the sample properties.

Note: all studies involving animals and/or human research participants must disclose whether blinding and randomization were used.

6. Statistical parameters
   For all figures and tables that use statistical methods, confirm that the following items are present in relevant figure legends (or in the Methods section if additional space is needed).

   - The exact sample size (n) for each experimental group/condition, given as a discrete number and unit of measurement (animals, litters, cultures, etc.)
   - A description of how samples were collected, noting whether measurements were taken from distinct samples or whether the same sample was measured repeatedly
   - A statement indicating how many times each experiment was replicated
   - The statistical test(s) used and whether they are one- or two-sided (note: only common tests should be described solely by name; more complex techniques should be described in the Methods section)
   - A description of any assumptions or corrections, such as an adjustment for multiple comparisons
   - The test results (e.g. P values) given as exact values whenever possible and with confidence intervals noted
   - A clear description of statistics including central tendency (e.g. median, mean) and variation (e.g. standard deviation, interquartile range)
   - Clearly defined error bars

See the web collection on statistics for biologists for further resources and guidance.

Nature Methods: doi:10.1038/nmeth.4578
7. Software

Describe the software used to analyze the data in this study.

Images were collected with Olympus FV1200. Raman spectra were collected with LabSpec 6 software. ImageJ 1.48b, OriginPro 8 and MATLAB R2012a were used to analyze the data.

For manuscripts utilizing custom algorithms or software that are central to the paper but not yet described in the published literature, software must be made available to editors and reviewers upon request. We strongly encourage code deposition in a community repository (e.g. GitHub). Nature Methods guidance for providing algorithms and software for publication provides further information on this topic.

8. Materials availability

Indicate whether there are restrictions on availability of unique materials or if these materials are only available for distribution by a for-profit company.

All unique materials used are available to nonprofit researchers from the authors on request.

9. Antibodies

Describe the antibodies used and how they were validated for use in the system under study (i.e. assay and species).

Anti-alpha tubulin antibody in rabbit was purchased from Abcam, ab18251. Anti-Histone H2B antibody in rabbit was purchased from Abcam, ab1790. Anti-Tom20 antibody in rabbit was purchased from Santa Cruz Biotechnology, sc-11415. Goat-anti-Rabbit secondary antibody solution was purchased from Millipore, AP132. All antibodies are validated by vendors.

10. Eukaryotic cell lines

a. State the source of each eukaryotic cell line used.

All cell lines were obtained from ATCC.

b. Describe the method of cell line authentication used.

Cell lines were authenticated by ATCC.

c. Report whether the cell lines were tested for mycoplasma contamination.

Cell lines were tested negative for mycoplasma contamination.

d. If any of the cell lines used are listed in the database of commonly misidentified cell lines maintained by ICLAC, provide a scientific rationale for their use.

No commonly misidentified cell lines were used.

11. Description of research animals

Provide details on animals and/or animal-derived materials used in the study.

No animals were used.

12. Description of human research participants

Describe the covariate-relevant population characteristics of the human research participants.

The study did not involve human research participants.