**Name of contact person –** Zihao Qu

**Email and phone number for contact person** – [zqu32@gatech.edu](mailto:zqu32@gatech.edu), 678-860-0375

**Format of data files** –TIFF (tif), JPEG (jpg), Adobe PDF (pdf), Text (txt), Atomic force microscopy images (Can be viewed and analyzed with NanoScope Analysis software, downloaded from http://nanoscaleworld.bruker-axs.com/nanoscaleworld/media/p/775.aspx)

**Location where data were collected –** World, North and Central America, United States, Georgia, Fulton county

**Time period during which data were collected –** 2015-12 to 2017-2

**File Information –** Files are named according to the submitted manuscript to Journal of Royal Society of Interface. All AFM data are raw data. There are thirty-five data files, including the meta data file and read-me file.

Figure 2, Supported, SEM images of (a,b) pecan, (c,d) Kentucky bluegrass, (e,f) ragweed and (g,h) acid-base treated ragweed pollen.

Figure 3 (a-d), Supported, SEM images of RTESPA-300 and RTESPA-525 AFM probes.

Figure 4(a-d), Supported, AFM images of HOPG and PS.

Figure 4(a-d)\_AFM, Unsupported, Raw AFM data of Figure 4.

Figure 5\_AFM, Unsupported raw AFM data of acid-base treated ragweed pollen for Figure 5.

Figure 6\_AFM, Unsupported, raw AFM data of the elastic modulus of pollen grains for Figure 6.

Figure 7& Figure 8\_AFM, Unsupported, raw AFM data of the elastic modulus of Kentucky bluegrass and pecan pollens.

Matlab Code, supported, the matlab code to eliminate the morphology effect of AFM nanoindentation on pollen grains.

Metadata file, Known.

Read-me file, Known.

**Definitions of acronyms, site abbreviations, or other project-specific designations used in the data file names or documentation files**

AFM: Atomic force microscopy;

CPk: clean pollen of Kentucky bluegrass;

CPp, clean pollen of pecan;

CPr, clean pollen of ragweed;

ABPr, acid-base treated pollen of ragweed;

WSPk, water-saturated pollen of Kentucky bluegrass;

WSPp, water-saturated pollen of pecan;

**Variable information** – N/A

**Uncertainty, precision, and accuracy of measurements** – N/A

**Environmental or experimental conditions** – All AFM measurements were taken with Bruker Dimension ICON, and at 24% relative humidity.

**Method(s)** Clean pollen grains and ABPr were characterized with a Zeiss Ultra-60 FE-SEM to reveal the morphology. Ethanol suspensions of the pollen grains were deposited by simple drop-casting and dried on silicon wafers at ambient conditions. Then, the silicon wafers were mounted on metal stubs using carbon tape and sputtered with Au/Pd in a Hummer sputtering system to prevent charge build-up during measurement. All images were obtained under an accelerating voltage of 5.0 kV or 10.0 kV.

**Standards or calibrations that were used** – N/A

**Software** – NanoScope Analysis software, downloaded from http://nanoscaleworld.bruker-axs.com/nanoscaleworld/media/p/775.aspx

**Quality assurance and quality control that have been applied –** N/A

**Limitations to reuse** – N/A

**Date dataset was last modified**

**Related materials** – N/A

**Data source** – N/A

**Related Files** – Data Acessibility, Known.