Details of Base-Acid (BA) Cleaning Step of Pollen

A sample of 10 g of pollen was dispersed in 80 mL of DI water in a 500 mL flask. A total of 6 g KOH were dissolved in 20 mL of water and added to the pollen-water mixture to make a 6 w% KOH solution. This was gently stirred for 24 h at room temperature. The mixture was neutralized with HCl and subsequently washed with hot water and ethanol in between centrifuging at 2800 rpm (vial caps were punctured in order to avoid vial breakage). The pollen was then dried in a convection oven at 60 °C overnight.

Base hydrolyzed grains were then re-suspended in water, sonicated to detach as much debris as possible, and centrifuged, the grains were added to a 500 mL flask while still suspended in a small amount of water. An aliquot of 200 mL of 85% H_3PO_4 was added to this flask and was refluxed at 50 °C for 7 d again with gentle stirring. The mixture was then centrifuged in several vials at 2800 rpm with punctured vial caps. Due the phosphoric acid's larger density, the pollen grain settled out at the top of the solution. A large 25 mL glass syringe with a long metal syringe needle was utilized to collect and discard the phosphoric acid at the bottom of the vial. The volume of the remaining pollen-phosphoric acid mixture was estimated by comparison to known volumes of water, in order to determine how much sodium hydroxide was required to neutralize the mixture. The mixture was diluted 4x the estimated volume with DI water and NaOH was dissolved in an equal amount of water. The diluted pollen mixture was combined with the NaOH mixture to create a neutral solution. These optimized neutralization steps proved to be key for attaining clean and intact pollen grains. Finally, the pollens were washed with hot water, acetone, and ethanol in between centrifuging at 2800 rpm. The acid hydrolyzed pollen was dried in a convection oven at 60 °C. The base-acid hydrolysis process caused the pollen grains to lose ~80% of their original weight.

Supplementary Figures and Data

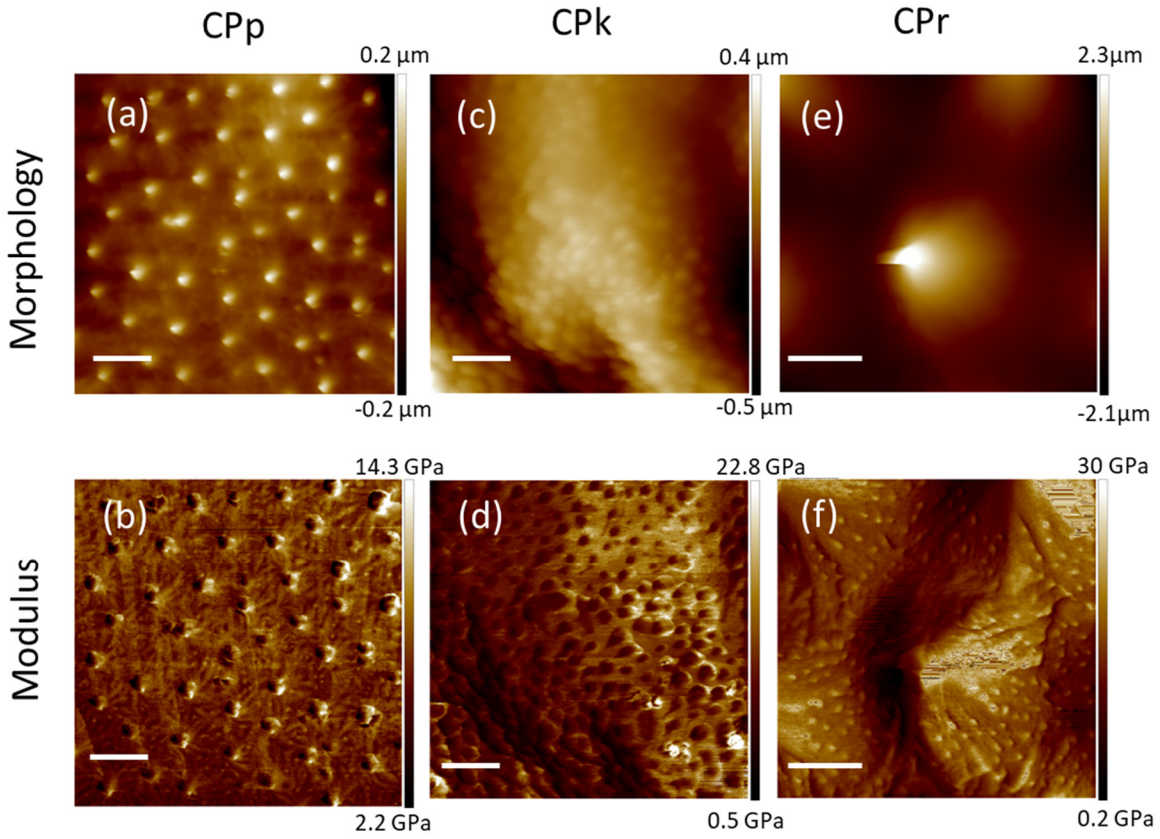

Figure S1. Morphology and modulus map of CPp, CPk and Cpr. Modulus data are reported based on flat area only. Scale bars are 1 µm.

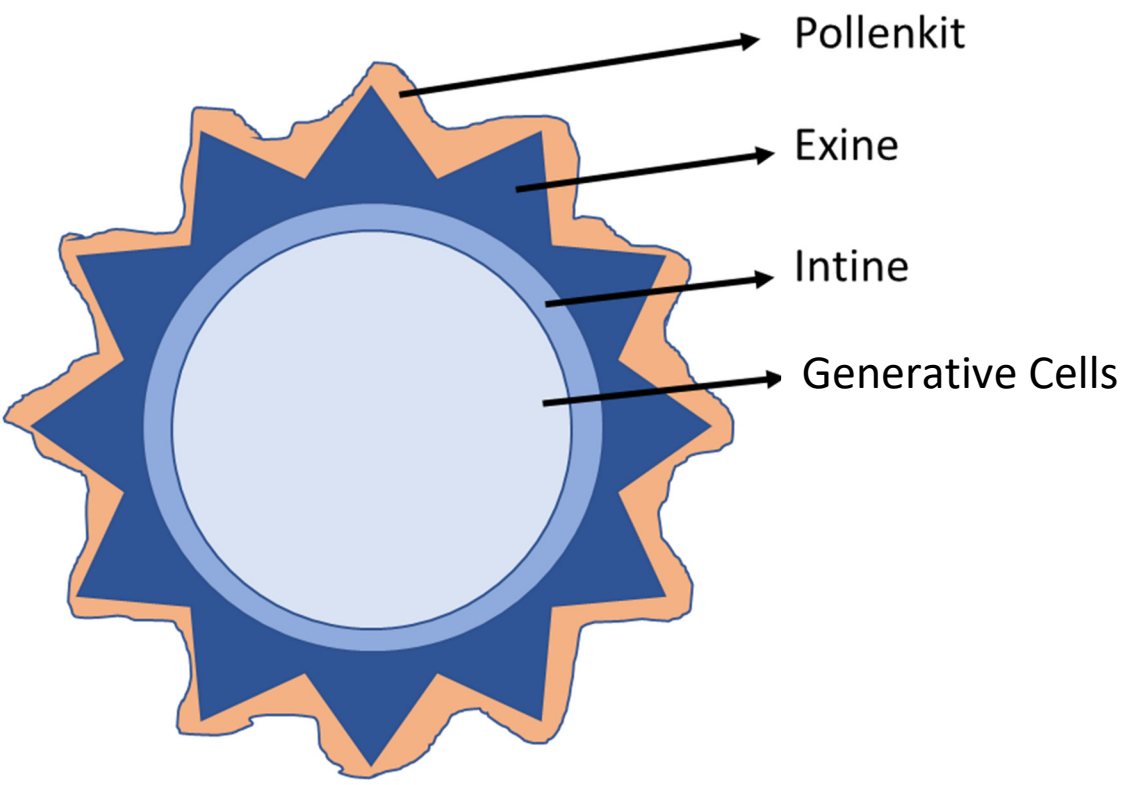

Figure S2. A schematic of native pollen grain.

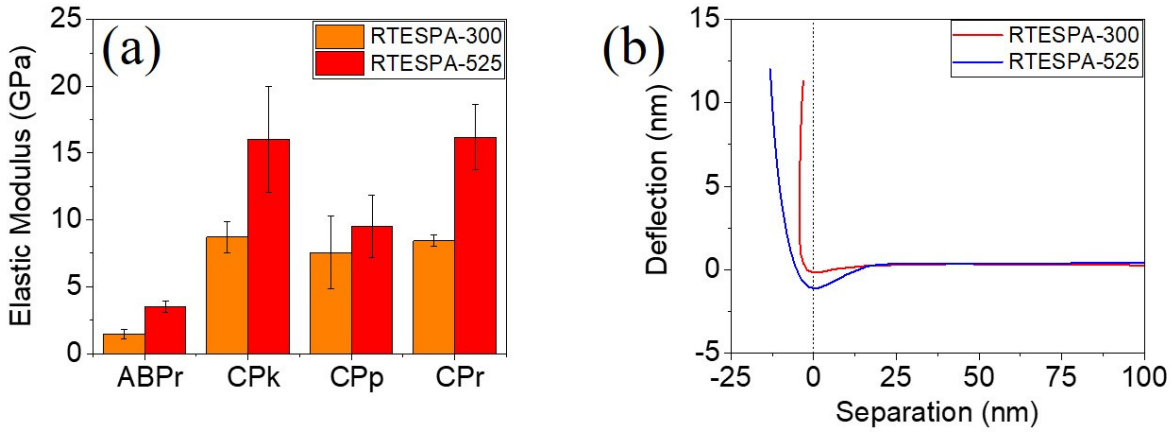

Figure S3. (a) The average moduli of BAPr, CPk, CPp and CPr by RTESPA-300 and RTESPA-500. (b) The deflection versus separation curves of RTESPA-300 and RTESPA-525 used to fit the DMT model; data were taken with a clean ragweed pollen as a representative.