FINGERPRINTING POLYSACCHARIDES WITH SINGLE MOLECULE ATOMIC FORCE MICROSCOPY

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We report the use of a novel AFM-based force spectroscopy technique to identify, at the single molecule level, the composition of mixtures of polysaccharides. Previously, we showed that the elasticity of certain types of polysaccharides is governed by force-induced conformational transitions of the pyranose ring. These transitions produce atomic fingerprints in the force-extension spectrum that are characteristic of the ground energy conformation of the pyranose ring and the type of glycosidic linkages. By using this approach we find that commercially available agarose and λ carrageenan contain molecules that, when stretched in an atomic force microscope, produce a force spectrum characteristic of α-(1,4) D-glucans. We have identified these molecules as amylopectin or Floridean starch, a storage sugar in algae. Our novel methodology can be used to identify individual polysaccharide molecules in solution which is not possible by any other spectroscopic techniques. Supported by the NSF and the NIH.