Abstract Submitted
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Microtubule Bundling and Shape Transitions DANIEL NEEDLEMAN, MIGUEL OJEDA-LOPEZ, URI RAVIV, KAI EWERT, JANYA JONES, HERBERT MILLER, LESLIE WILSON, CYRUS SAFINYA, UCSB — Microtubules (MTs) are hollow cylindrical polymers composed of heterodimers of the protein tubulin that align end-to-end in the MT wall, forming linear protofilaments that interact laterally. Placing MTs under osmotic pressure causes them to reversibly buckle to a noncircular shape and pack into rectangular bundles at a critical osmotic pressure; further increases in pressure continue to distort MTs elastically. At higher osmotic pressures stressing polymers may be forced into the MT lumen causing the MTs to revert to a circle cross-section and pack into hexagonal bundles. This SAXRD-osmotic stress study provides a probe of the inter-protofilament bond strength and gives insight into the mechanisms by which microtubule associated proteins and the cancer chemotherapeutic drug Taxol stabilize MTs. We present further measurements of the mechanical properties of MT walls, MT-MT interactions, and the entry of polymers into the microtubule lumen. Supported by NSF DMR- 0203755, NIH GM-59288 and NS-13560, and CTS-0103516. SSRL is supported by the U.S. DOE.

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