



INSTITUTIONEN FÖR KEMI OCH MOLEKYLÄRBIOLOGI

Effect of microwaves on microtubule structure and function probed by light and X-ray scattering

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Abstract

We are constantly exposed to radiation in some form or another from our environment. High frequency electromagnetic radiation, including ultraviolet light and X-rays, cause damage to living organisms due to ionization events. Microwaves are known to cause heating and may also induce non-thermal effects in living organisms. It is therefore important to distinguish between thermal and non-thermal effects of microwave radiation and provide evidence for their biological effect. In this thesis we use light scattering to show that microwaves have a non-thermal functional effect on a protein complex called microtubules, which are biological nanotubes that stretch for several microns in length in eukaryotic cells. We also use X-ray scattering to measure whether or not microwaves cause a structural perturbation to microtubules in solution. Finally, this thesis examines the potential of coherent diffractive imaging at an X-ray free electron laser for single-particle imaging of biological fibres, including microtubules.