UNIVERSIDAD DE BURGOS
ESCUELA DE DOCTORADO

TESIS DOCTORALES

TÍTULO: A MULTIDISCIPLINARY APPROACH TO DNA NANO/BIO-PHYSICS

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RESUMEN:

El ADN es una molécula altamente dinámica donde los pares de bases, que contienen información genética, pueden sufrir grandes fluctuaciones. La estructura del ADN ha sido ampliamente estudiada y conocida. Sin embargo, la comprensión de su dinámica, que influye de manera determinante en los procesos biológicos, es limitada.

La tesis está dedicada al estudio de estas dinámicas durante la desnaturalización térmica del ADN, que consiste en la separación completa de las cadenas que forman la doble hélice del ADN. Hemos explorado el melting del ADN con diferentes técnicas, experimentales y teóricas y lo hemos estudiado en muestras ordenadas, como fibras de ADN.

Se ha propuesto: un modelo teórico para el estudio de la dinámica; Caracterización física la transición de desnaturalización del ADN; Un método de síntesis para el diseño de fragmentos de ADN con secuencia controlada, para estudiar su flexibilidad, y caracterización de las fibras de A-DNA mediante microscopía AFM-RAMAN

Biophysics plays a key role in the understanding of biological processes at the nanoscale level. DNA is a highly dynamic molecule in which base pairs, which contain genetic information, can suffer large fluctuations. The structure of DNA has been widely studied and is well known. However, the understanding of DNA dynamics, which has a decisive influence on biological processes, is limited.

The thesis is dedicated to the study of these dynamics, specifically during the thermal denaturation of the DNA molecule, which consists in the complete separation of the chains that form the double helix of DNA. We have explored the melting transition of DNA with different experimental and theoretical techniques. And although historically this phenomenon has been widely studied in solution, in the thesis we have also studied it in ordered samples such as DNA fibers.

A theoretical model has been proposed for the study of DNA dynamics; the DNA denaturation transition has been physically characterized; a specific synthesis method has

been developed for the design of small DNA fragments, with controlled sequence, which allow to study the flexibility of d-DNA and the physical properties of A-DNA fibers / films have been characterized by AFM-RAMAN spectroscopy to evaluate its application in nano-engineering