NANOSTRUCTURES: CONFINEMENT, PROXIMITY AND INDUCED EFFECTS

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Physics in confined geometries is one of the most active areas of research in Solid State Physics. The extensive activity in this field is driven by the fact that physical length scales are close to structural sizes which can be controlled using modern thin film and lithography techniques. In addition, a number of applications in the areas of information storage and sensors have moved basic research results into the application area in a very short period of time.

I will describe a variety of representative basic research results which illustrate some of the exciting and novel results when magnetic and/or superconducting materials are confined into small dimensions. Interesting effects are observed when these dimensions are comparable to magnetic length scales such as dipolar, exchange, and domain sizes and superconducting length scales such as the penetration and coherence lengths. Particular experiments will relate to confinement effects due to quantum mechanical quantization, a variety of proximity effects in which dissimilar materials have strong effects on each other and phenomena which are induced by external means such as electric and magnetic fields, light, etc.

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