Título: NANOESTRUCTURAS ÓPTICAS HÍBRIDAS FLEXIBLES PARA APLICACIONES COMO FILTROS DE RADIACIÓN ULTRAVIOLETA.

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Resumen: The escalating applications of ultraviolet light, specifically in the UVA and UVB part of the spectrum, in medicine, cosmetics, or for industrial and commercial purposes in general demand deeper studies of the hazards involved in the use of this type of electromagnetic radiation as well as further research in the development of new materials for selectively protecting against it. It is well-known that UV radiation causes damage to organic materials like plastics, woods, or polymers, among others. In general, the formation of free radicals, due to light absorption induced chemical reactions, results in subsequent polymer photodegradation. Regarding the effect on human tissue, there is a vast and growing literature regarding the harmful effects of ultraviolet radiation on the skin, as more epidemiologic

and basic research continues to illustrate the impact of sun exposure and other sources of UV radiation upon the appearance of cutaneous neoplasm and a variety of photosensitive dermatoses or skin cancer. Films used for UV blocking can be classified according to the physical mechanism responsible for the protection effect, namely, optical absorption or reflection. This fundamental difference determines that a completely diverse materials design will have to be used to achieve control over spectral selectivity. From a different perspective, when reflection, rather than absorption, of UV wavelengths is sought after, more complex multilayered architectures must be employed, so that interference effects can give rise to the desired blocking effect. In this context, the development of polymer films that act as shields against ultraviolet (UV) radiation constitutes nowadays an active and interesting field of research, since they could be used as adaptable coatings for a wide variety of UV sensitive environments. The main objective of this thesis is the development of nanoparticle based flexible structures with photonic crystal properties that shield against UV radiation through optical reflection phenomena. The suggested approach will allow to accurately select the range of wavelengths blocked. This represents a much more efficient alternative to UV absorbing compounds, whose protection mechanism gives rise to secondary undesirable chemical reactions with the consequent photodegradation of these materials. Most of the mentioned drawbacks could be overcome with the use of the sheets whose evaluation in a real system, protecting epithelial cells from UV radiation, will be provided here. The versatility of the proposed photonic structures, due to their flexibility, transferability and adaptability to all kinds of substrates, enables them for interesting applications as UV optical filters. First of all, TiO_2, ZrO_2, Nb_2O_5 nanoparticles were successfully synthesized as suitable building blocks for one dimensional photonic crystals. Rigid coatings and flexible self-standing films were designed to be capable of efficiently protecting against UV radiation in selected wavelength ranges entirely through optical reflection phenomena. It was demonstrated that these films may equal or outperform layers of similar thickness made of purely absorbing materials in terms of the degree of radiation protection achieved.