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Material modification induced by thermal annealing: Prospects of a new approach to the registration properties of heavy ions in a PADC high polymer film

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A wide variety of polymer material effects are induced by thermal annealing. The effectiveness of a particular material is found to vary not only with the thermal annealing but also with the type of ion and its energy and ionization rate i.e., with the nature of the ion tracks. Moreover, a significant transformation of the registration properties of charged particles in these polymer materials is induced by thermal annealing. An overview is presented of some thermal annealing experiments which were carried out on the high polymer material poly allyl diglycol carbonate PADC (a form of CR-39) exposed to different radioactive sources. This work highlights the fact that the annealed PADC films are highly sensitive to the fission fragments and particles heavier than alphas ($z \geq 6$), but not to alpha particles. Recent experiments have been performed at the Nuclear Physics Research Laboratory, University of Benghazi. These show, without any doubt, that the response of thermally treated PADC material to charged particles is not always restricted to heavy ions with high ionization rates; particles with low ionization rates is somewhat restricted.

Biography

Abdallah F. Saad earned his Ph.D. degree in 1993 from the University of Zagazig according to the channel system between Institute of Nuclear Physics, Forschungszentrum Jülich, Germany and Zagazig University, Egypt, and postdoctoral studies from Aomori University, Japan. He is currently serving as a visiting Professor at the University of Benghazi, Libya and is permanently working at Zagazig University. He has mainly participated in several new findings. Recently, his current research focuses on studying material modifications induced by thermal annealing and radiation. He has published more than 20 papers in reputed journals and serving as a reviewer of several international journals.

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Smart coatings for materials protection: Opportunities and future challenges

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The concept of 'self-healing', 'self-repairing' or 'smart' materials has in recent years been developed experimentally in new types of manufactured materials creating a new class of multifunctional materials of self healing properties. Such properties add functionality to the materials to heal themselves automatically after mechanical, physical or chemical damages caused, for example, by scratch, impact, abrasion, erosion, friction, corrosion, wear, fire, ice, etc. The huge economic impact of the corrosion of metallic structures is a very important issue for all modern societies. Reports on the corrosion failures of bridges, buildings, aircrafts, automobiles, and gas pipelines are not unusual. It is estimated that corrosion and its consequences cost developed nations between 3% and 5% of their gross domestic product. The process involving hexavalent chromates is the most effective and most widely used conversion coatings for corrosion protection for many metals and alloys. However, the carcinogenic effect and environmental waste due to chromates are well documented. The development of active corrosion protection systems for steels, Al and Mg substrates is an issue of prime importance in key industries, including petroleum, chemicals, and transportation. The present work provides new insights towards the development of new protective systems with self-healing functionality. The proposed coatings characterize with the self-healing ability, ease of application at low cost and safety. When the new chromate-free surface treatments are applied prior to fluoropolymer top coating, the coatings exceed 2000-hour salt spray tests. The approach described herein can be used in many industrial applications where active corrosion protection of materials is required.

Biography

Abdel Salam Hamdy Makhlouf is an expert having over 19 years of experience in basic and applied research involving surfaces and interfaces related to coatings, surface treatment, surface modification, corrosion, nanotechnology, electrochemistry, advanced materials, and surface engineering. Dr. Makhlouf is a multiple-award winner for his academic excellence. He has been awarded the National Prize of Egypt in Advanced Science and Technology 2006, Egyptian Prize of Excellence in Surface Technology and Corrosion 2006 and Egyptian Prize of Excellence and Innovation in Materials Science and their Applications 2009. He received also several prestigious awards in USA, Germany, Canada and Belgium such as Humboldt Research Award for Experienced Scientists at Max Planck Institute, Fulbright Visiting Scholar Award, NSF, DOE and NSERC Postdoctoral.

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