

EPJAP Special Issue after C2I'2010

This special issue of The European Physical Journal is based on a choice of papers selected by the scientific committee of the Fifth “Conférence Interdisciplinaire en Instrumentation” (C2I'2010) which was held at Le Mans in January 2010.

This conference was created in 1998 in the École Normale Supérieure of Cachan. Second, third and fourth conferences were organized in Paris in 2001, 2004 and in Nancy in 2007, respectively, with approximately the same level of success, with regard to both participation and quality of papers. The goal of the C2I series is to propose to scientists, coming from different disciplines, to present their works in the interdisciplinary area of instrumentation. Since the first edition, the EPJAP journal is a partner and published a selection of papers from those presented in the C2I series. In past C2I editions, people came mostly from French laboratories and industries; however, papers from ten other countries were also presented. For the C2I'2010 edition, 157 participants heard 52 oral presentations, organized around two parallel sessions, among which there were four plenary invited papers. Furthermore, a poster session with 37 papers stimulated discussions during coffee breaks. An all-public conference dealing with instrumentation in the international project ITER (International Thermonuclear Experimental Reactor) completed this wide panorama and received a large audience. Lots of scientific fields were covered, from fundamental sciences to applications in metrology, non-destructive testing, engineering sciences, life sciences, chemistry, biology, etc.

This special issue is composed of four papers, selected from topics related to microsystems, microsensors and instrumentation for nano-sciences. The choice of these fields and papers was difficult, because of the high quality of the papers presented at C2I'2010, and also because our aim was to point out the diversity in this field of instrumentation.

The first paper deals with the development of a new passive wireless pressure sensor, based on the electromagnetic transduction. This completely passive and wireless pressure telemetry microsensor was designed, fabricated and characterized, thereby eliminating the need for contact, signal processing circuits, and power supplies to be contained within conventional sensors. The second paper discusses the use of ellipsometry to determine glass temperature transitions of isostatic polymethyl methacrylate ultra-thin films and isolated chains deposited on a silicon wafer surface. The technique operates systematically at various wavelengths on the thin films and isolates globular chains, deposited on piranha-treated surfaces, and reveals the presence of multiple transitions. The third paper presents a microfluidic system associated with a fiber optic surface plasmon resonant (SPR) sensor, developed to monitor in real time the variation of the sensor responses to kinetic reaction occurring at the surface of a biological sample. Experimental measurements establish kinetic parameters that are used in the numerical model and this demonstrates the potential of the fiber optic SPR sensor for biological analysis purposes. The last paper describes the development of a gravimetric surface acoustic wave (SAW) biosensor combining the sensitivity of gravimetric transduction, and affinity between several molecules: biotine/streptavidin/antistreptavidine and biotine/HRPstreptavidin/antistreptavidin. The different steps of the biosensor development and temporal follow-up of its response are presented. The effects of the presence of macromolecules are also discussed.

Issue after issue, we have seen through the works presented by researchers and engineers that performing reliable and complex instrumentation leads to improving the understanding of the physical, chemical or biological phenomena. It also increases the synergy between disciplines, which helps to achieve more sophisticated progress in instrumentation design and performance. We hope that the reader will find in this journal a good illustration of these concepts, through this short selection of papers. Expecting that our range of knowledge should still widen, we are currently preparing the next edition of the C2I, which will be held in Lyon in January 2013.