Nano-science with Synchrotron Radiation

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A number of synchrotron radiation facilities and their users have been growing rapidly world wide and have feasted new important discoveries and excitement in various scientific and technological areas including materials science, biological and life science, electronics, environmental engineering, etc. covering almost all aspects of scientific and technological disciplines. Drastic improvements in time, spatial, energy, and spectroscopic resolutions have been realized recently in comparison to the conventional light sources and provided strong motivations to revisit many unresolved scientific issues as well as to explore new issues emerging in new technological initiatives. Nano-technology is one of them. The Pohang Light Source (PLS), one of many third-generation synchrotron light sources currently operational worldwide, has been upgrading a number of beamlines and installing new beamlines in order to provide Korean NT community with highly focused and ultra bright soft and hard x-ray sources and experimental stations with nano-scale resolving power and stability. This paper introduces some of those beamlines, their capabilities and recent important discoveries obtained from such efforts. Ferroelectric nano-devices have been one of such issues that have been explored extensively using this new light source in recent years. Some of recent attempts and discoveries related to nano size effects in ferroelectric materials are also introduced to demonstrate the unique features and opportunities of nano-focused synchrotron radiation.