Biosimilars-2013
OMICS Group Conferences
Accelerating Scientific Discovery
2nd International Conference and Exhibition on
Biowaivers & Biosimilars
September 23-25, 2013 Raleigh, North Carolina, USA

PNIPAM hydrogels and PLGA nanoparticles: Applications in drug delivery systems

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Abstract

Poly(*N*-isopropylacrylamide) (PNIPAM) gels have attracted considerable attentions from both academic and technological aspects. At the phase transition temperature (*ca.* 34 ^{o}C), PNIPA gels undergo an abrupt volume change, which can be utilized in several promising applications such as drug delivery systems and actuators. We have synthesized PNIPA bulk/micro gels containing polymer surfactant poly(2-(methacryloyloxy) decylphosphate) (PMDP) and found to show rapid volume phase transition above its transition temperature.[1-3] Structurally PNINA-PMDP gel system contains the trapped micelles of PMDP inside the PNIPA networks. Therefore, at least in principle the gel system tightly stores targeted drug in the micelles and rapidly releases controlled amount of the drug by switching on-off of external stimuli such as temperature or infrared laser beam. Recently we reported on controlled-releasing profile of the PNIPA-PMDP gel system using (+)-L-ascorbic acid and temperature as a targeted drug and a stimulus, respectively.[4] The PNIPA and PNIPA-PMDP gels were used to obtain an on-off release profile of (+)-L-ascorbic acid in response to a temperature change. The PNIPA-PMDP gel released the L(+)-ascorbic acid slowly and gradually with time at 27 ^{o}C which is lower than the phase transition temperature, 34 ^{o}C. The gel did not stop the release within the investigated time scale. On the other hand, the gel rapidly releases the drug and finished the release within 10 min at 40 ^{o}C which is higher than the phase transition temperature. [4] Herein I also talk on synthesis of PLGA nanoparticles and their drug-loadings. [5]

Biography

Upon completion of his doctorate in chemistry at The University of Tokyo in 1995 Dr. Yan joined the R&D group at Ibaraki Research Laboratory, Hitachi Chemical Industry Co. Ltd. where he carried out research works to develop sophisticated electronic components by utilizing functional polymers. After his research works on conductive polymers at Tokyo University of Science, Yamaguchi for 6 years and on polymer gels at Hokkaido University for 3 years, Dr. Yan joined the Laboratory of Organic Robotics at the University of Yamanashi in 2007 where he is an Associate Professor. Before his above career in Japan, Dr. Yan had been educated in China, i.e., in Jilin University (1978-1982) for Bachelor of Science and in Henan Institute of Chemistry (1984-1987) for Master of Science. Dr. Yan who is a full professor of Zhengzhou University since 2011 has published 8 books, 59 papers, and 31 patents.