OMICS International
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Wlodzimierz Stanczyk et al., J Material Sci Eng 2016, 5:2 (Suppl)
http://dx.doi.org/10.4172/2169-0022.C1.011

International Conference and Exhibition on
Materials Chemistry
March 31-April 01, 2016 Valencia, Spain

Synthesis of the first POSS cage - Anthracycline nano-conjugates

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The antitumor drugs Doxorubicin (DOX) and dauno-rubicin (DAU) are important anthracycline antibiotics of a broad spectrum of action, widely used in therapy. Unfortunately they can cause also serious cardiovascular side effects leading to heart failure. Thus, currently a focus is being made on synthesis of nanoparticles bearing DOX and DAU that should limit exposure of drugs to normal cells. Pathways, including encapsulation e.g. in poly(lactide-co-glycolide, poly(trimethylene carbonate-co-glutamic acid) and solid lipid nanoparticles were studied. On the other hand a number of carriers was applied for chemical bonding of doxorubicin that include polymeric and dendrimer nanoparticles or fatty acids. Polyhedral oligomeric silsesquioxanes (POSS) have been surprisingly missing from the above list of anthracycline nanocarriers, although octameric POSS is considered a next generation material in biological fields. Herein we present the synthesis of the first two, according to our knowledge, T8-POSS-doxorubicin (Scheme 1) and daunorubicin conjugates. T8-POSS cage can be easily functionalised and its small size (~1.5 nm) makes it an unique carrier, compared to the ones studied till now in binding anthracyclines. It is also well known to facilitate cell penetration, the important feature in drug delivery processes, while on decay forms only a harmless silicic acid - Si(OH4).

Biography

Wlodzimierz Stanczyk has completed his PhD and DSc at Lodz University of Technology and Post-doctoral studies from University of Sussex. He is the Head of Inorganic-Organic Composites Research Group at CMMS. He has published more than 100 papers in reputed journals in the area of organometallic and polymer chemistry.

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