Journal of Analytical Methods in Chemistry

Hindawi

Special Issue on

Analytical Methods in Polymeric Nanomaterials Development for Cancer Theranostics

CALL FOR PAPERS

The use of nanotechnologies can improve water solubility, thermal stability, and drug target. Polymeric nanomaterials (PNs) have gained acceptance as potential nanocarriers for drug delivery because of their solubilization potential for water-insoluble drugs. Different types of PNs, including polymeric micelles (PMs), can be developed, depending on the structure of the amphiphilic copolymer used and the solution parameters (polymer concentration, solvent type, pH, ionic strength, temperature, solvent/cosolvent ratio, and others). In particular, PMs are composed of amphiphilic polymers that have the ability to self-assemble into micellar structures consisting of a hydrophilic outer shell and a hydrophobic inner core in aqueous environment which make them very attractive for drug delivery in cancer. The hydrophobic core constitutes a microenvironment for the incorporation of hydrophobic drugs, whereas the hydrophilic corona-forming components of PMs enable these nanosystems to circulate for an extended period of time in the bloodstream which allows them to reach tumor tissues by means of the enhanced permeability and retention (EPR) effect. In general, PNs have an optimum size between 10 and 100 nm, are very stable, and have a slower rate of dissociation, allowing the retention of the loaded drugs for a long period of time in the bloodstream and a high accumulation of the drug at the target cells/tissues/organs.

Thus, in the formulation of these smart PNs it is quite important to evaluate and to optimize their physicochemical properties, their encapsulation efficiency (EE), and drug loading capacity (DL). For these, different methods can be used being the most common the direct dissolution, dialysis, evaporation or film method, freeze-drying, microphase separation, and the oil-in-water emulsion. It is also important to know the size, polydispersion index, and zeta potential. These can be achieved and improved using a combination of analytical methods like dynamic light scattering (DLS), differential scanning calorimetry (DSC), thermogravimetry (TGA), single-crystal X-ray crystallography (XRD) or powder X-ray diffraction (PXRD), nuclear magnetic resonance (NMR), Raman and Fourier Transform InfraRed (FTIR), and HPLC (high-pressure liquid chromatography). Aligned with the therapeutic potential of PNs in drug delivery is their potential in theranostics. Theranostics combine therapeutics with diagnostics, aiming at monitoring the response to treatment and increasing drug efficacy and safety, which represents a key part of personalized medicine and a considerable advance in predictive medicine. Theranostics combining technique may result in the acceleration of drug development, the improvement of disease management, and the reduction of risks and costs. Theranostics are a useful concept when designing nanotechnology based imaging contrasting agents and imaging-guided therapeutics. Once again the improvement of analytical methods is a key part on it, namely, updating magnetic resonance imaging (MRI), positron emission tomography (PET), single-photon emission computed tomography (SPECT), luminescence probes, surface assisted laser desorption ionization mass spectrometry (SALDI-MS), and others.

We invite researchers to contribute with the submission of original articles and reviews related to new nanoformulation insights into cancer theranostics. We encourage the submission of articles with implicit analytical methods development that contribute to cancer theranostics.

Potential topics include but are not limited to the following:

- Recent advances in cancer theranostics using polymeric nanomaterials
  - Magnetic resonance imaging (MRI)
  - Positron emission tomography (PET)
  - Single-photon emission computed tomography (SPECT)
  - Luminescence probes
  - Surface assisted laser desorption ionization mass spectrometry (SALDI-MS)
- New insights into analytical methods for polymeric micelles physicochemical characterization
  - Dynamic light scattering (DLS)
  - Differential scanning calorimetry (DSC)
  - Thermogravimetry (TGA)
  - Single-crystal X-ray crystallography (XRD) or powder X-ray diffraction (PXRD)
  - Nuclear magnetic resonance (NMR)
  - Raman
  - Fourier Transform InfraRed (FTIR)
  - HPLC (high-pressure liquid chromatography)
- Polymeric nanomaterials to increase bioavailability of biopharmaceuticals, including peptides, proteins, and antibody drugs (dialysis, freeze-drying)
- Polymeric nanomaterials and nanotoxicology
  - Transmission electron microscopy (TEM)/Cryo-TEM
  - Electrospray-differential mobility analysis (ES-DMA)
  - Single particle inductively coupled plasma mass spectrometry (sp-ICPMS)
- Hybrid polymeric nanomaterials
  - Micellar liquid chromatography
  - Reversed phase high-performance liquid chromatography (RP-HPLC)
- In silico, in vitro, and in vivo models to mimic polymeric nanomaterials mechanisms
  - Molecular dynamics (MD) simulations
  - Cryogenic electron microscopy (Cryo-EM)
  - Fluorescence resonance energy transfer (FRET) microscopy
  - Flow cytometry

Authors can submit their manuscripts through the Manuscript Tracking System at https://mts.hindawi.com/submit/journals/jamc/pnd/.

Papers are published upon acceptance, regardless of the Special Issue publication date.

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