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Highlight

1. Successful RAFT synthesis of a pH responsive nanohydrogel
2. *In vitro* pH responsive drug release by the nanohydrogel
3. Cellular uptake and tumor cell cytotoxicity of the drug adsorbed nanohydrogel
4. Safety and hemocompatibility assessment of the developed nanohydrogel

Abbreviations

NH: Nanohydrogel

NP: Nanoparticles

RAFT: Reversible addition–fragmentation chain transfer

CRP: Controlled free radical polymerization

HEMA: Hydroxyethyl methacrylate

DMAEMA: N, N-dimethylaminoethyl methacrylate

PEG-DA: poly (ethylene glycol)-diacrylate

AIBN: Azobis isobutyronitrile

DOX: Doxorubicin

NMR: Nuclear magnetic resonance

FT-IR: Fourier-transform infrared spectroscopy

TEM: Transmission electron microscopy

DLS: Dynamic light scattering

MTT: 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide

EPR: Enhanced permeability and retention

DMSO: Dimethyl sulfoxide

SEM: Standard error of mean

RBC: Red blood cell

MW: Molecular weight

7 AAD: 7-aminoactinomycin D

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