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Sonochemical Assembly of Copper/Iron-modified Graphene Oxide for Anti-Inflammatory Drug Delivery

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Nonsteroidal anti-inflammatory drugs (NSAIDs) are among the most commonly prescribed medications worldwide to treat the inflammation and pain. When the drug is delivered to the human body through the gastro-intestinal system, the latter undergoes bleeding and develops gastritis after repeated doses of ketorolac over prolonged duration. Many approaches are being put towards administration of ketorolac at a lower dose and shortening period of the systemic exposure while maintaining its therapeutic efficacy.

Nanomedicine offers tools based on molecular carriers aiming at an increase of the drug surface area by reducing particle size and modification of the surface thereby causing more rapid dissolution and absorption by target tissue. Graphene oxide (GO) in its pristine or modified form can be used as a successful drug molecular carrier due to its high surface area, biocompatibility and a very rich surface chemistry. Sonochemistry is an efficient tool for the modification of GO in aqueous solution via the interaction with acoustic bubbles acting as hot spots.

For the first time we successfully developed a new sonochemical technique involving assembly and encapsulation of the anti-inflammatory drug ketorolac in the copper/iron-modified GO nanocomposite. The latter can acquire advanced molecular carrier properties in aqueous solution due to the submicron particle size and enlarged copper/iron-rich surface of GO nanosheets. We demonstrate that our molecular carrier for ketorolac can enable controlled release of this drug by varying the pH value of aqueous solution and help to reduce the therapeutic dose and side effects in the gastro-intestinal system.

Biography

Darya Radziuk has completed her PhD from the Max-Planck Institute of Colloids and Interfaces (Germany) under the supervision of Prof. H. Möhwald and Dr. D. Shchukin, and postdoctoral studies from the University of Illinois at Urbana-Champaign (USA) in the group of Prof. K. Suslick. She is the recipient of the Jean-Louis Luche Prize, Best Technical Paper award, DFG and Max-Planck research fellowships, ERIC-CERIC grant. She has published 23 peer-reviewed scientific papers as the first author.

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