Spectral-luminescent properties and photochemical activity of amphiphilic chlorins in aqueous microheterogeneous systems

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Chlorophyll derivatives are promising photosensitizers for biomedical applications, such as photodynamic therapy and fluorescent diagnostics, as well as for industrial applications, including photovoltaic energy conversion and photocatalytic wastewater treatment. Most of the above applications require specific forms of photosensitizers, which resist both aggregation and photodegradation, and remain photoactive in aqueous solutions. For this purpose we focused on the aggregation behavior, photophysical properties and photochemical activity of a number of chlorophyll *a* derivatives in aqueous microheterogeneous systems.

In this report we discuss solubilization and photochemical activity of amphiphilic chlorins in different micellar systems depending on the charge and HLB of the two components. We also address polymer binding of chlorin derivatives in solutions, including specific intermolecular interactions with biomacromolecules, such as albumin, and chlorin-containing fluorescent polyelectrolyte complexes. Finally, we consider chlorin-loaded polymer nanoparticles for biomedical applications, chlorin-doped polymer thin films (including ferroelectric ones) with photoinduced antimicrobial activity, and chlorin-modified magnesium silicate microparticles for photodynamic wastewater disinfection and organic pollutant photooxidation.

All the above microheterogeneous systems provide supramolecular regulation of photophysical properties, and hence, control photochemical activity of chlorin-based photosensitizers by determining local parameters of their microenvironment.

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LITERATURE

1. **M.A. Gradova**, **et al**. J. Porphyrins Phthalocyanines (2022) (in press).
2. **I.V. Loukhina**, **et al**. Russ. J. Gen. Chem., **91** (2021) 697-706.
3. **M.A. Gradova**, **et al**. Macroheterocycles, **13** (2020) 23-32.
4. **M.A. Gradova**, **et al**. Mendeleev Commun., **28** (2018) 589-591.