Nanocomposites and nanomaterials

Cholesterolcontaining cooligomers for lipofilic substances solubilisation

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Application of cholesterol-containing cooligomers which in the aqueous medium form micelles, micellar aggregates, nanospheres and others colloidal formations of different morphology is one of the promising trends of creations carriers for lipophilic drugs.

The acylations of cholesterol by binary cooligomer maleic anhydride - co - ethylthrioxyethylenemethacrylate, namely by the MA link gives the cholesterol containing cooligomer poly(cholesterylmaleinate-co-maleic anhydride-co-ethylthrioxyethylenemethacrylate) (CholMA-MA-PEMA) whith the different contents of the cholesterol fragments (Mm 5000-9000). Subsequent hydrolysis of the MA fragments with alkali in the aqueous medium leads to the -C(O)OH group transformations into ionized salt form (CholMA-MA-PEMA)Na (Fig).

Fig. Oligomeric molecule (CholMA-MA-PEMA)Na

(CholMA-MA-PEMA)Na forms micelles and micellar aggregates in colloidal solutions. They form the lipophilic core of cholesterol fragments able to solubilize lipophilic substances: Sudan dye, anticancer drug curcumin, hydrocarbons. The conductometry, dynamic light scattering, ring tear and solubilization of lipophilic dyes permit to determine critical micelle concentration (CMC) and critical concentration of aggregate-formation (CAC). It was shown that in aqueous colloidal solutions at the concentrations below CMC the (CholMA-MA-PEMA)Na oligomeric molecules exist as unimolecular micelles which at the concentrations increase up to CAC form the micellar aggregates.

Micelles and micellar aggregates in the (CholMA-MA-PEMA)Na aqueous colloidal solutions are able to solubilize the lipophilic Sudan dye; the solubilization value (g/g cooligomer) increases symbatically to the cholesterol content in (CholMA-MA-PEMA)Na and at the concentration of $1.0 \cdot 10^{-4}$ % is 3.9 – 5.1 g/g cooligomer at pH 7.0 and 8.7 – 12.5 g/g cooligomer at pH 8.0.