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Содержание

- | | | |
|---|------------|---|
| Е.Н.Ушаков,
С.П.Громов | 787 | Супрамолекулярные методы управления межмолекулярными реакциями [2 + 2]-фотоциклоприсоединения непредельных соединений в растворах |
| А.Я.Малкин,
В.Г.Куличихин | 803 | Структура и реологические свойства высококонцентрированных эмульсий. Современный взгляд |
| А.Б.Ярославцев,
Т.Л.Кулова,
А.М.Скундин | 826 | Электродные наноматериалы для литий-ионных аккумуляторов |
| К.М.Бойко,
В.О.Попов,
М.В.Ковальчук | 853 | Перспективные методы кристаллизации макромолекул, уменьшающие конвекционный транспорт вещества к растущему кристаллу |
| Л.А.Карцова,
Е.А.Бессонова | 860 | Биомедицинские приложения метода капиллярного электрофореза |
| Е.А.Черникова,
Л.М.Глухов,
В.Г.Красовский,
Л.М.Кустов,
М.Г.Воробьева,
А.А.Коротеев | 875 | Ионные жидкости как теплоносители: сравнение с известными системами, возможные области применения, преимущества и недостатки |

Contents

Supramolecular methods for controlling intermolecular [2 + 2]-photocycloaddition reactions of unsaturated compounds in solutions 787

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Methods of supramolecular chemistry used to control the efficiency and selectivity of the intermolecular [2 + 2]-photocycloaddition reactions of alkenes and other unsaturated compounds in homogeneous solutions are surveyed. The most studied methods are self-assembly through cation–macrocycle interactions, complexation with molecular templates *via* hydrogen bonds and confinement of reactants in supramolecular containers. The possibilities of using anionic templates and combined supramolecular approaches are discussed.

Bibliography — 107 references.

Structure and rheology of highly concentrated emulsions. Modern view 803

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The current state of physical, chemical and mechanical approaches for investigating the structural features of highly concentrated emulsions that determine their rheological properties are considered. The structure and properties of various systems such as emulsions, suspensions and transient forms including micellar colloid solutions are compared. The formation of highly concentrated emulsions is treated as the concentration glass transition, which suppresses the molecular and supramolecular mobility and results in the existence of a region of solid-like state. The primary attention in the review is given to analysis of viscoplasticity, which implies the possibility of irreversible deformation (flow) for highly concentrated emulsions, unlike suspensions, as the critical stress called the yield stress has been exceeded. The issue of thixotropic nature of the transition through the yield stress caused by the kinetics of breakup/recovery of the inherent structure is considered in details. It is shown that the structure formation in highly concentrated emulsions can be extended to the macro-level, which results in flow heterogeneity as shear banding.

Bibliography — 202 references.

Electrode nanomaterials for lithium ion batteries 826

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The state-of-the-art studies dealing with cathode and anode nanomaterials for lithium ion batteries are discussed. It is shown that the use of nanomaterials can increase the charge and discharge rates, reduce the adverse effect of degradation of electrode materials related to changes in their volume upon lithium intercalation and deintercalation and enhance the power and working capacity of lithium ion batteries. In consideration of cathode materials, the attention is focused on lithium and transition metal double phosphates and silicates and vanadium oxides. Anode materials based on nanodispersed forms of carbon, silicon, some metals and oxides and nanocomposites are described.

Bibliography — 714 references.

Promising approaches to crystallization of macromolecules suppressing the convective mass transport to the growing crystal

853

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Conditions of mass transport to growing crystals are important factors affecting the size and quality of macromolecular crystals. The mass transport occurs by two routes: diffusion and convection. By changing (either suppressing or enhancing) the convective transport, quality of the crystals can be affected. The review gives an overview and analysis of published data on various methods for macromolecular crystallization based on suppression of convective flows to growing crystals in order to improve the crystal quality.

Bibliography — 91 references.

Biomedical applications of capillary electrophoresis

860

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Modern analytical approaches used in capillary electrophoresis for solving medical and biological problems are considered: the search for biomarkers of various diseases and instant diagnosis based on characteristic profiles of biologically active compounds by capillary electrophoresis with mass spectrometric detection; monitoring of the residual drugs in biological fluids for evaluating the efficiency of drug therapy; testing of the enantiomeric purity of pharmaceuticals; the use of novel materials as components of stationary and pseudo-stationary phases in capillary electrophoresis and capillary electrochromatography to increase the selectivity of separation of components of complex matrices; and identification of various ways of on-line preconcentration to reduce the detection limits of biologically active analytes. A topical trend in capillary electrophoresis required in clinical practice, *viz.*, the design of microfluid systems, is discussed.

Bibliography — 173 references.

Ionic liquids as heat-transfer fluids: comparison with conventional systems, possible applications, advantages and disadvantages

875

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The practical aspects and prospects of application of ionic liquids as heat-transfer fluids are discussed. The physicochemical properties of ionic liquids (heat capacity, heat conductivity, thermal and radiation stability, viscosity, density, saturated vapour pressure and corrosion behaviour) are compared with those of some commercial thermal fluids. The issues of toxicity of ionic liquids are considered. Particular attention is paid to these properties of known organosilicon heat-transfer fluids, which are considered to have much in common with ionic liquids in the set of properties and are used in the review as reference materials.

Bibliography — 132 references.