ACTIVE PHARMACEUTICAL SUBSTANCES – POSSIBILITIES AND EXPECTATIONS

B. Kratochvíl
University of Chemistry and Technology
Prague, Technická 5, 166 28 Praha 6, Czechia, bohumil.kratochvil@vscht.cz

Rational (Scientific) Medicine is based on treatment with chemical compounds (active pharmaceutical ingredients, APIs). APIs consist of either small or large active molecules. Medicines based on small molecules are called drugs, medicines containing large molecules are called biopharmaceuticals or biologics. There are about 12,500 APIs on the global pharmaceutical market, both drugs and biopharmaceuticals. APIs (in brand products) are ranked according to world sales every year.

The choice of the optimal API for a specific solid drug formulation means the optimization of its properties (solubility, dissolution rate, biavailability, stability, etc.) and patent non-collision statut, of course. For the selection of the optimal API, several dozens of solid pharmaceutical phases may be available from one active molecule (anhydrates, polymorphs, hydrates, salts, cocrystals). In pharmacy, the reduction in number of solid phases is given by the condition of pharmaceutical acceptability, see the GRAS directive [1].

The most widely used APIs in pharmaceutical formulations are salts and hydrated salts (over 50% of all current dosage forms). Salts are stable and well soluble in polar solvents (in an aqueous environment of the gastrointestinal tract, GIT), because they contain ionic bond. A necessary prerequisite for the formation of salts is the presence of ionizable groups (acidic or basic) in the molecule. In 75 % of the pharmaceutical salts, the active substance forms the cation in the 25 % anion. The most frequent counteranions are hydrochlorides, followed by sulphates and hydrobromides. The most frequent countercations are Na^+, Ca^{2+}, K^+ and Mg^{2+}. According the GRAS directive about 70 countercations and about 20 counteranions are available for salt formulations. Each pharmaceutical salt has a pHmax value with the maximum solubility, which can be correlated with the pH values of GIT parts for the best drug absorption.

The author thanks for the financial support of the grant GACR P206 16-10035S.

References

1. *https://www.fda.gov/Food/IngredientsPackagingLabeling/GRAS/.*

VIBRATIONAL SPECTROSCOPY – FROM MACRO- TO NANO-WORLD

Pavel Matějka[1], Martin Král[1], Alžběta Kokaislová[1], Marcela Dendisová[1], Marie Švecová[2], Adéla Jeništová[1], Jiří Janoušek[2]

[1]University of Chemistry and Technology
Faculty of Chemical Engineering, Department of Physical Chemistry
Technická 5, 166 28 Prague 6 - Dejvice, Czech Republic, pavel.matejka@vscht.cz

[2]University of Chemistry and Technology
Faculty of Chemical Engineering, Department of Analytical Chemistry
Technická 5, 166 28 Prague 6 - Dejvice, Czech Republic, marie.svecova@vscht.cz

Vibrational spectroscopy (VS) is represented by two complementary techniques based on either Raman scattering or infrared radiation absorption effect. Their surfaced-enhanced (SEVS) techniques are valuable tools for physico-chemical studies of the metal-adsorbate interface and for analytical applications focused on detection of low/trace amounts of various substances. Nevertheless, their disadvantage is inadequate lateral resolution which is equal to the lateral resolution of corresponding "normal" ("macro" and classical "micro") Raman and infrared spectroscopy limited by light diffraction. The irradiated surface area in usual SEVS micro-spectroscopic experiment contains relatively huge quantities of adsorbed molecules. However, for exact description of adsorption processes and intermolecular interactions, it is necessary to obtain spectra of single molecules and/or assemblies