5.4: Conclusions and Review

Advances in drug development such as high throughput have increased the total and variety of drug candidates whose clinical usefulness is principally limited to a great degree by the following:

- Water insolubility;
- Chemical or physical instability;
- Local irritation after administration

Cyclodextrins alleviate many of these issues. As evidence, there are currently around 30 different cyclodextrin pharmaceutical products on the market that include different types of pills, capsules, parenteral solutions, nasal sprays, suppositories, eye drops, and skin products. Cyclodextrins tend to replace organic solvents, enhance oral bioavailability, reduce gastrointestinal irritation, and increase dermal availability. In addition, animal and human studies have demonstrated that cyclodextrins improve drug delivery.

Addition of cyclodextrins to existing formulations will seldom result in acceptable outcome. We still lack deep knowledge of the physical factors involved in complex formation. Cyclodextrins form both inclusion and non-inclusion complexes in aqueous solutions. It has also been shown that cyclodextrins form aggregates that are able to solubilize in a micellar-like fashion; their exact structures are not known, nor is the way they influence drug delivery

Review Questions

1. What are ways that ion exchange columns can be improved to ensure maximum efficiency? In other words, what is the principle that governs their functionality?
2. Why is paper such a good medium for chemical reactions?
3. Does a practical limit exist for the variations of combinatorial chemical processes that can be studied?
4. Can you envision a way that CD systems can aggregate in human circulatory systems?

Further Reading

1. Cagniard de la Tour C. 1822 Exposé de quelques résultats obtenu par l'action combinée de la chaleur et de la compression sur certains liquides, tels que l'eau, l'alcool, l'éther sulfurique et l'essence de pétrole rectifiée. Ann. Chim. Phys. 21, 127– 132.
2. Andrews T. 1869 The Bakerian Lecture—On the continuity of the gaseous and liquid states of matter. Phil. Trans. R. Soc. Lond. 159, 575–590.
3. Licence P, Ke J, Sokolova M, Ross SK, Poliakoff M. 2003 Chemical reactions in supercritical carbon dioxide: from laboratory to commercial plant. Green Chem. 5, 99–104.
4. Tang SLY, Smith RL, Poliakoff M. 2005 Principles of green chemistry: PRODUCTIVELY. Green Chem. 7,761–762.
5. Lovelock KRJ, Villar-Garcia IJ, Maier F, Steinrück H-P, Licence P. 2010 Photoelectron spectroscopy of ionic liquid-based interfaces. Chem. Rev. 110, 5158–5190.