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The concept of flow “fine” synthesis, that is high yielding and selective organic synthesis by flow methods, will be presented. Flow methods have several advantages over batch methods in terms of environmental compatibility, efficiency, and safety. However, synthesis by flow methods is more difficult than synthesis by batch methods. Indeed, it has been considered that synthesis by flow methods can be applicable for the production of simple gasses but that it is difficult to apply to the synthesis of complex molecules such as natural products and active pharmaceutical ingredients (APIs). Therefore, organic synthesis of such complex molecules has been conducted by batch methods. On the other hand, syntheses and reactions that attain high yields and high selectivities by flow methods are increasingly reported. Flow methods are leading candidates for the next generation of manufacturing methods that can mitigate environmental concerns toward sustainable society.

Modern organic synthesis is used for the synthesis of a wide range of useful compounds, and many synthetic reactions can be used to achieve high yields and high selectivities. Although the phrase “fine organic synthesis”\(^1\) is used occasionally, the word “fine” is often omitted because modern organic synthesis has developed to the stage that only reactions that proceed with high levels of control and efficiency are used routinely. On the other hand, according to classifications of synthetic methods, conventional organic syntheses involve almost exclusively batch methods, and the term “modern organic synthesis” is actually an abbreviation of “organic synthesis by batch methods.” Again, because “by batch methods” is self-evident, it is typically not necessary to include the clarification.

However, syntheses and reactions that attain high yields and high selectivities by using flow methods have also been increasingly reported. These methods are properly classified as organic synthesis, however, as mentioned above, because modern organic synthesis is “organic synthesis by batch methods,” it seems inappropriate to call these methods simply organic synthesis. It may be termed “organic synthesis by flow methods;” however, at this moment, the quality and quantity of organic synthesis may be different between “organic synthesis by batch methods” and “organic synthesis by flow methods.” Therefore, instead of “organic synthesis by flow methods” we may use the term “flow fine synthesis,” which is “fine organic synthesis by flow methods,” wherein “fine” is the goal of flow synthesis.\(^2\)

In this presentation, several examples of flow “fine” synthesis using heterogeneous catalysts will be discussed.\(^3\)

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<th>Conventional organic synthesis</th>
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1. The phrase “fine organic synthesis” may not be very common as an English phrase but is often used as the corresponding Japanese; “Seimitsu Yuuki Gousei,” where “Yuuki Gousei” is “Organic Synthesis” and “Seimitsu” is corresponding to “Fine.” The meaning is close to Stereoselective Synthesis or Modern Organic Synthesis.