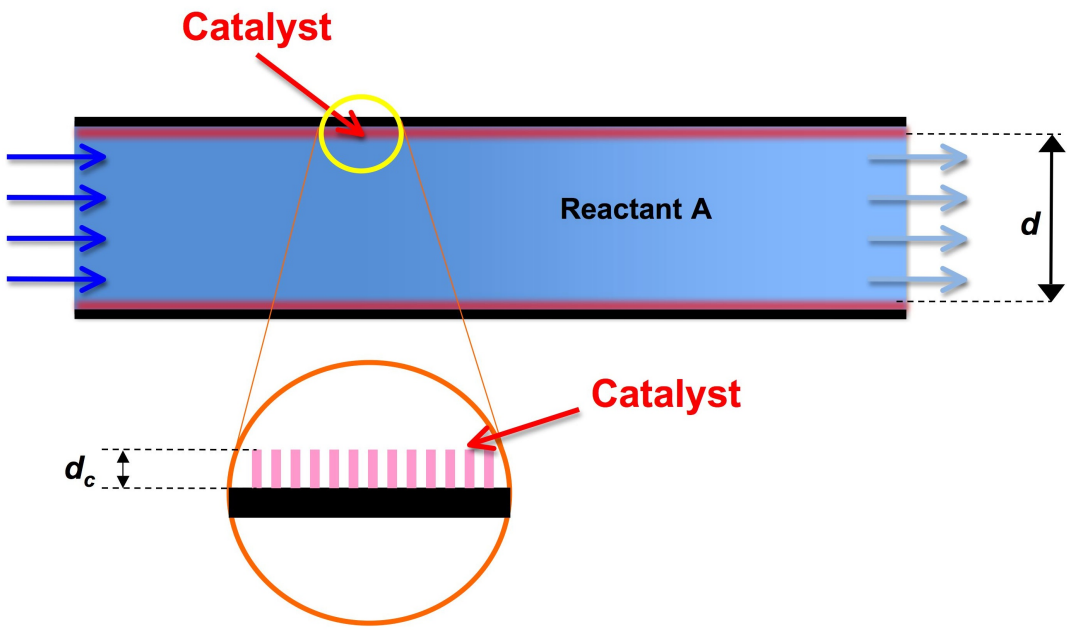
# Microchannel Reactor With Solid Catalyst

**The goal of this project is to establish: i) a suitable flow model (to predict velocity distribution); and ii) a chemical process (to predict conversion of reactant A) in a microreactor with catalyst deposited at the walls of the reactor. A typical disposition of catalysts in this type of chemical reactors is illustrated in the figure below. It would be of particular interest to consider a catalyst layer, on microreactor walls, as a porous media through which the flow of fluid is feasible.**




**Simple analysis of reaction processes, which could be realized in this type of reactors indicates that they are mass transfer limited, i.e. the transport of reactant(s) through the bulk of the liquid and through the catalyst layer presents the largest resistance to the chemical reaction process.**

**The chemical reaction, which takes place at catalyst surface is represented by the following surface kinetics:**

$$A \xrightarrow{k''} products \qquad \frac{1}{S_{cat}}\frac{dN_A}{dt} = \frac{1}{S_{cat}}\frac{dN_B}{dt} = -k''C_A \left[\frac{mol\ A}{m_{cat}^2 s}\right]$$

**The objectives in this project are:**

**1. To present background information that would justify consideration of a microscale-based technology.**

**2. To collect appropriate data, which will help your effort in the analysis and the design of the chemical process.**

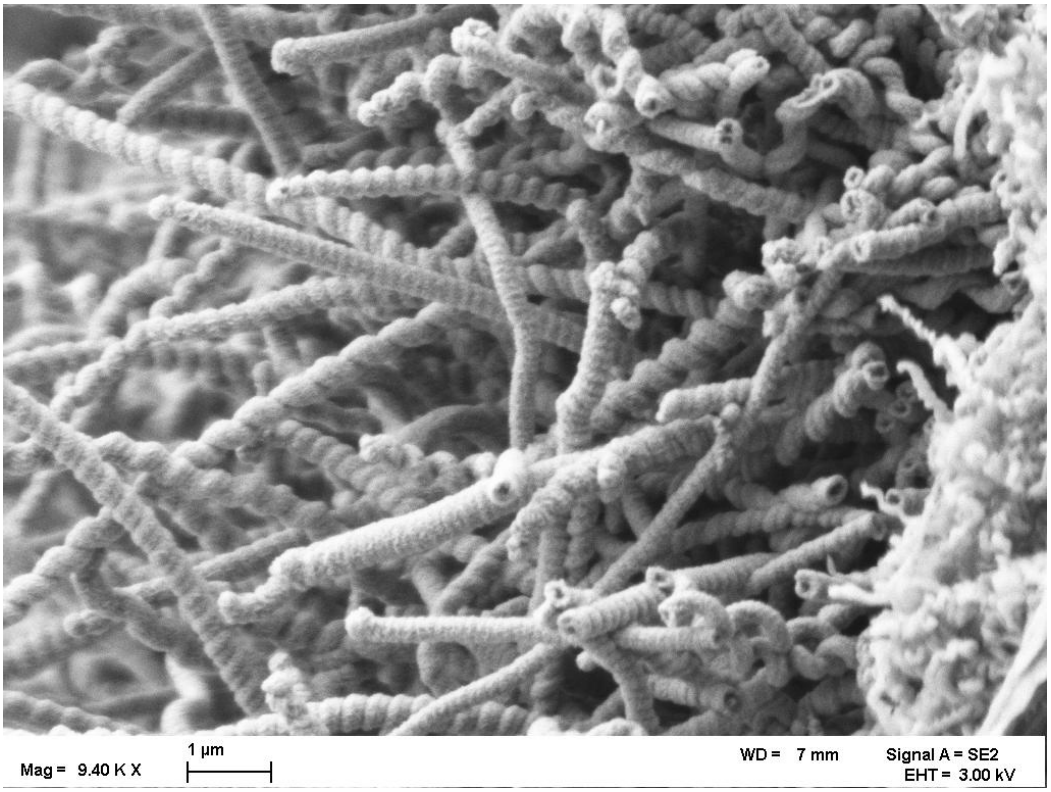
**3. To "construct" Mathematical Model that would assist you in producing velocity profile, and conversion of the reactant A in the microreactor. In this objective you have to include assumptions, differential equations, boundary and initial conditions, or any other type of information that makes the model workable and particular.**

**4. To numerically simulate envisioned flow distribution, and chemical conversion of reactant A (velocity profile, pressure drop, concentration profile) using the mathematical model developed in this project. This section should contain graphics created from the simulation (COMSOL for example) and other graphs that would illustrate the results of your work. Parametric study of the model is probably the best way to benefit from your work in modeling and simulation.**

**5. To analyze modeling results and reflect on the success of the model, especially in relationship with experimental data (if used).**

**6. To indicate challenges encountered in this project, and suggest what should be done in future similar efforts.**

**7. To prepare a power point presentation and a technical report which will follow the format that will be suggested separately.**




**Example of a catalyst layer on the wall of a microchannel reactor. (GoNano reference)**