Institut für Chemieingenieurwesen
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Bachelor/Master thesis, Research Internship:

Raytracing and Visualization of Photochemical Reactors

Scope of the Project:
The main goal of the project “Photon Fluxes in microstructured photoreactors” is the development of general design and application rules to optimize photochemical process concepts. For this purpose, different reactor setups are investigated by conducting photochemical reactions with well-known properties in the reaction volume to calculate the available photon flux from the conversion over irradiation time. This technique is called actinometry.

Combined with radiometric measurements, the whole radiation field can be characterized to give general advice on different factors contributing to reach the best possible efficiency for numerous specific photoreactions. Some of these factors are e.g. the type of the light source, reactor geometry and material or residence times and starting concentrations. However, in some cases the effects of light scattering and refraction are not straightforward to interpret.

A third tool which is getting more and more common for the investigation of photochemical reactors is computational ray tracing. By this method, the path of a ray trough the reactor can be simulated, taking effects like scattering diffraction and absorption into account. By this means, unwanted effects which decrease the efficiency of the reactor can be identified. Furthermore, the efforts for reactor prototyping and testing can be reduced. For the evaluation of the ray tracing calculations visualization is key for an easy interpretation of the results. Hence, the aim of this project is to establish a ray tracing routine for the commonly used python based ray tracer pvtrace.

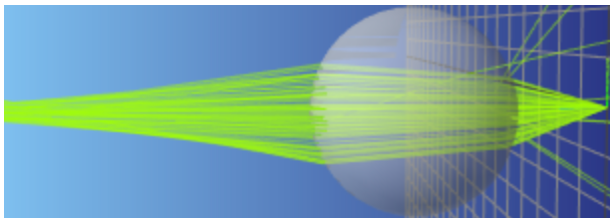

Figure 1: *A simple ray tracing case in pvtrace.*

Possible Working Packages:

For this work, the establishment of a working ray tracing tool is crucial, which is expected to be easily realized with the available toolbox. After that, the simulation reactor geometries should be conducted for different designs with increasing complexity. The extend of this complication is based on the given time for the respective work. Another crucial point will be the validation of the simulated results with results of already available acinometry and radiometry results.

Qualification: This work requires programming skills as well as having fun with code and its optimization.

If interested please contact:

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