Contribution ID: **575**

Type: **Poster Presentation**

Understanding the Reactive Transport and Retention Behavior of Engineered Virus-mimicking Nanostructures

Tuesday, 23 May 2023 10:30 (1h 30m)

With the recent COVID-19 pandemic, different viruses in the environment and their disastrous effects has drawn the sharp attention of researchers and scientists worldwide. In recent years, the release of viruses has been a serious concern around the globe.

This inspired us to investigate more about what happens once a virus is released. Deciphering how various virus species act in a system of environmental mobility will be extremely interesting. This will enable us to understand and forecast their fate and transport behavior in various subsurface environments.

The release and migration of viruses in aqueous environments is a primary focus of this investigation. A short examination of the literature reveals that the majority of articles focus on representative viral species, such as bacteriophage MS2 and PhiX174. This might be an earlier made hypothesis on common viral behavior. Here, it is assumed that model viruses show similar transport and retention phenomena as all hazardous viruses. This might be due to various regulatory constraints and challenges that come into the picture when working with viruses that are lethal to humans. We assume that different viral species may behave differently based on their surface chemistry and physical morphology. Which has not been accounted distinctively in the literature, as most of them use model virus strains. Therefore here, we put out our hypothesis that natural viruses or more specifically their surfaces can be mimicked by utilizing engineered nanoparticles. Such surfaces can be further compared with natural viruses in terms of their transport and retention behavior in a saturated porous media environment.

Here, we are using a novel approach for synthesizing, surface-modified silica nanoparticles to closely resemble the physicochemical characteristics of virus surfaces. Physical characteristics like size, shape, and surface morphology are closely considered during the synthesis and post-modification processes, as well as surface chemistry characteristics including surface potential, particle density, and soft framework. These particle surficial features will be achieved in several stages of modification and optimization in the synthesis process. This will let us study the effect of individual elements on nanoparticle transport and retention behaviors. The results from the column sorption experiments will be studied under different environmental conditions and interpreted using numerical modelling tools.

Participation

In-Person

References

MDPI Energies Student Poster Award

Yes, I would like to submit this presentation into the student poster award.

Country

Norway

Acceptance of the Terms & Conditions

Click here to agree

Energy Transition Focused Abstracts

Primary authors: Mr RAJAK, Jai Kishan (Norwegian University of Science and Technology); Dr FOPPEN, Jan Willem (IHE Delft Institute for Water Education); Dr BANDYOPADHYAY, Sulalit (Norwegian University of Science and Technology)

Presenter: Mr RAJAK, Jai Kishan (Norwegian University of Science and Technology)

Session Classification: Poster

Track Classification: (MS18) Innovative Methods for Characterization, Monitoring, and In-Situ Remediation of Contaminated Soils and Aquifers