Final Report

Project acronym: *NESSIE*

Project number*: 4319*

M-ERA.NET Call 20*16*

Period covered: 1/5/2017 to 31/12/2020

Publishable project summary

Virus-like particles (VLPs) and viral vectors (VVs) are revolutionizing medicine by offering targeted vaccines. Production of VLPs and VVs is costly and time consuming. One of the main reasons is that its purification by chromatography, the state-of-the-art technique, has performance drawbacks. We have developed novel targeted surface-modified chromatographic materials for purification of these complex biopharmaceuticals. Ultra-high definition structured monoliths were produced by post-modification of shapes produced by additive manufacturing (AM). We used ceramic-based AM techniques with ~50 micrometer resolution to produce mechanically stable isoreticular monoliths for downstream processing of clarified bioreaction bulks of adenoviruses and retro-VLPs as model cases. The use of AM techniques was also applied to design the flow distributors in the separation processes, precisely controlling the flow distribution. The project also designed novel continuous chromatographic methods to reduce time lags and thus production cost. The results showed that the design has to be tailored to the manufacturing process toachieve stringent specifications once that we are printing at the pixel-level. The modifications of 3D printed alumina possess some inherent difficulties that has to be overcome to make the process commercially available. The holistic approach taken by NESSIE can allow a fast and decentralized production of chromatographic substrates which are valuable to produce vaccines for the world population.