Experimental report

16/02/2021

Proposal: 9-12-622 **Council:** 4/2020

Title: Internal and hierarchical morphology of poly(2-phenyl-2-oxazoline) (HPPhOx)/DNA aqueous self-assemblies

Research area: Soft condensed matter

This proposal is a resubmission of 9-12-601

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Apostolos VAGIAS

Local contacts: Robert CUBITT
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Samples: H2O
D2O
DNA
poly(2-phenyl-2-oxazoline), [C9H9NO]n
Sodium Chloride, NaCl

Instrument	Requested days	Allocated days	From	To
D33	4	2	30/08/2020	01/09/2020

Abstract:

The purpose of this proposal is to investigate using small angle neutron scattering (SANS) and contrast-variation SANS at ambient conditions the nanoscale aqueous morphology of protonated assemblies between hydrolyzed poly(2-phenyl-2-oxazoline) (abbreviated as HPPhOx) polyelectrolytes and DNA macromolecules, as a function of ionic strength, HPPhOx to DNA concentration ratio and HPPhOx molecular weight. Self-assemblies from HPPhOx have proven to be successful encapsulation scaffolds of biomacromolecules. The D33 instrument at ILL posesses large enough spatial resolution (q-range: 5 ×10-3 to 0.25 A-1)to elucidate structural features in the HPPhOx/ DNA assemblies at different length scales: such as mesh size, internal domains, fractal hierarchical structures and aggregation. D2O will be utilized as solvent to achieve large contrast with respect to the protonated macromolecules. Contrast variation by changing the H2O/D2O volume ratios will be used in order to decouple the net contribution of different constituents (separate contribution of DNA from HPPhOx) in the structuration (e.g. mesh size, fractal aggregate dimensions) of these complex polyelectrolyte assemblies.

The experiments of the proposal 9-12-622 have been successful, since the respective results have provided helpful guidelines for successful static Small Angle X-ray scattering and stopped flow Ultra Small Angle X-ray scattering (TR-USAXS) experiments of the joint proposal at ID02 beamline ESRF that took place immediately after. The data analysis of proposal 9-12-622 and of sc4998 at ESRF is ongoing. The data will form a manuscript that will be submitted soon. An additional challenge of these experiments for the local contact has been the remote measurement protocol with the mail-in procedure, as physical presence of coproposers was not possible. All challenges have been successfully tackled. The local contacts of the respective proposals at D33 and ID02, Dr. Sylvain Prévost and Dr. Narayanan Theyencheri respectively, will be included as coauthors.