Quantitative Assessment of Corrosion Products Release Rate in Liquid LBE

The world first accelerator driven research reactor, MYRRHA, will be constructed at SCK-CEN. This unique research facility will use liquid lead-bismuth eutectic as a primary coolant and as spallation target. The coolant technology and coolant chemistry in particular are the key issues for any nuclear system. It requires to conduct research on underlying chemical and physical process in order to understand and to incorporate them in the technology under development. Among possible sources, corrosion products formed due to dissolution and oxidation of alloying elements of fuel cladding and structural steels are expected to be a major source of solid and dissolved impurities. Removal of these solid particles and dissolved impurities from the liquid metal is of primary importance for stable and long term operation of MYRRHA. In order to predict the effect of corrosion products on the operation of MYRRHA, to design an optimal coolant purification systems, and to develop mitigation methods the understanding of the release behavior of corrosion products and the quantitative assessment is crucial.

The biggest challenge in investigation of liquid metal corrosion is that the methodology of corrosion assessment used for aqueous corrosion is not straightforward applicable. The new methods for the assessment of corrosion products release rates should be developed and verified. Therefore the main goal of this PhD is to develop new methods in corrosion assessment based on obtained experimental data and using the understanding of underlying processes developed in framework of other PhD works on liquid metal corrosion and to improve the qualitative and quantitative understanding of the release behavior of corrosion products in LBE.

The dedicated experimental set-up with well controlled parameters as chemistry, temperature and liquid metal flow velocity using the unique instrumentation is under development at SCK-CEN. The experimental program conducted with this set-up should result in the representative for MYRRHA conditions data set to establish the corrosion product rates. Combining experimental results and thermochemical analysis, release rates of each important corrosion product (Fe, Ni, Cr) will be estimated.

For further information on this position, please check the link on the website of SCK-CEN.

Please send an email to herman.terryn@vub.be with CV and motivation letter if you want to apply for this position.