Contribution ID: **2** Type: **Poster**

Decontamination of Low Radioactive Liquid Waste from Oils and Petrochemicals Using UV Radiation at NPPs

Thursday, 15 May 2014 17:30 (1h 15m)

Nuclear power plants with WWER and RBMK reactors annually generate 30000 to 100000 m3 of various liquid radioactive wastes. The increasingly growing amount of liquid radioactive waste of medium (MAW) and low activity (LAW) has made their reprocessing an acute issue. The main task is the separation of the long-lived radionuclides of fission products, the residual amounts of actinides (U, Np, Pu, Am, and Cm), and radioactive corrosion products of the construction steels (60Co, 63Ni, 54Mn, 55Fe, 59Fe, etc.). In addition to the radionuclides, liquid MAW and LAW contain a large amount of various salts (up to 200 g/l), chelating compounds (EDTA, surfactants, etc.), traces of various oils, petroleum, and organic compounds. Their presence complicates both the separation of radionuclides from liquid waste and liquid waste decontamination technologies. The main methods of concentrating liquid LAW at nuclear power plants are distillation and ion exchange. During the evaporation of oil-containing aqueous LAW, part of the petrochemical products get into the condensate. Decontaminating this condensate with ion-exchange resins leads to their oiling and, consequently, decreases their operation resource. This work studies the possibility of using UV radiation for decreasing the content of petrochemical products in liquid LLW. The experiments were carried out on distilled water containing spindle oil in a model solution and real liquid LAW from the Kalinin Nuclear Power Plant. The model solution contained the following compounds (g/dm3): NaNO3 (0.166), Na2SO4 (0.074), KNO3 (1.576 and 1.295), NH3 (1.0), and spindle oil (17.10-3). The real solutions contained water from the floor drain pan (FDP), the degassed water pump (DWP), and the pure condensate tank (PCT). In addition to petrochemicals, the floor drain water contained 134Cs (4.18.105 Bq/dm3), 137Cs (6.85.105 Bq/dm3), 54Mn (23.94.102 Bq/dm3), 131I (4.07.104 Bq/dm3), 60Co (7.92.103 Bq/dm3), and 24Na (12.32.103 Bq/dm3); Fe (1.2 mg/ dm3), Na (3 mg/dm3), and K (0.27 mg/ dm3); H3BO3 (2.2 g/dm3); pH 9-12.

The work used mercury lamp placed directly in the solutions, which led to the heating of the irradiated solutions.

The obtained data show that UV irradiation allows decreasing the petrochemicals content in the water solutions to a great extent, which will benefit the operation of ion-exchange resins in the liquid LAW decontamination systems.

Primary author: Dr KULEMIN, Vladimir (Frumkin's Institute of Physical Chemistry and Electrochemistry, Russian Academy of Sciences)

Co-author: Prof. KULUYKHIN, Sergey (Frumkin's Institute of Physical Chemistry and Electrochemistry, Russian Academy of Sciences)

Presenter: Dr KULEMIN, Vladimir (Frumkin's Institute of Physical Chemistry and Electrochemistry, Russian Academy of Sciences)

Session Classification: Poster Session - Chemistry of Nuclear Fuel Cycle / 1st ASGARD International Workshop

Track Classification: Chemistry of Nuclear Fuel Cycle / 1st ASGARD International Workshop