Pemanfaatn amonium zeolit dan polimer dalam pengolahan limbah air pendingin reaktor nuklir

---

Abstrak

PEMANFAATAN AMONIUM ZEOLIT DAN POLIMER DALAM PENGOLAHAN LIMBAH AIR PENDINGIN REAKTOR NUKLIR. Pengoperasian reaktor nuklir akan menimbulkan limbah radioaktif yang salah satunya adalah limbah air pendingin primer yang mengandung hasil belah Sr90, Cs137 dan produk korosi Co60 . Limbah ini harus dikelola dengan baik agar tidak memberikan dampak bagi masyarakat dan lingkungan. Telah dilakukan penelitian pengolahan limbah air pendingin primer dengan memanfaatkan zeolit murni dan amonium zeolit, serta imobilisasi zeolit bekas menggunakan polimer. Penelitian bertujuan untuk mempelajari kemampuan penyerapan zeolit murni dan amonium zeolit terhadap Sr, Cs dan Co, serta karakteristik hasil imobilisasi. Percobaan dilakukan secara catu dengan mengkontakkan zeolit murni dan amonium zeolit dengan limbah air pendingin reaktor simulasi yang mengandung Sr, Cs dan Co dalam berbagai waktu kontak. Imobilisasi amonium zeolit bekas dengan polimer dilakukan pada berbagai kandungan limbah 10, 20, 30, 40 dan 50 % berat. Karakteristik blok polimer-amonium zeolit bekas yang dipelajari adalah densitas, kuat tekan dan laju pelindihan. Hasil penelitian menunjukkan bahwa waktu kontak optimal adalah 90 menit dengan efisiensi penyerapan amonium zeolit lebih tinggi dibandingkan zeolit murni, dengan urutan: Sr > Co > Cs. Karakterisasi blok polimer-amonium zeolit bekas menunjukkan bahwa semakin besar kandungan limbah maka densitas dan laju pelindihan semakin tinggi dan kuat tekan semakin turun. Karakteristik blok polimer-amonium zeolit bekas terbaik diperoleh pada kandungan limbah 20 % berat dengan densitas 1,3051 g/cm-3, kuat tekan 9,68 kN/cm-2 dan tidak terdeteksi adanya hasil belah yang keluar dari blok polimer-amonium zeolit bekas. Kata kunci: Hasil belah, air pendingin reaktor, zeolit, polimer. ABSTRACT UTILIZATION OF AMMONIUM ZEOLITES AND POLYMERS IN TREATMENT OF COOLANT WASTE OF NUCLEAR REACTOR. Operation of nuclear reactor generates radioactive wastes, and one them is the waste from primary coolant water that contain fission products Sr90, Cs137 and corrosion product Co60 . This waste must be managed to prevent impact to the community and environment. A research on treatment of primary cooling water that contain fission products by utilizing pure zeolite and ammonium zeolite, and immobilization of the spent ammonium zeolite with polymer has been completed. The aim of the research is to study both the sorption ability of pure zeolite and ammonium zeolite to Sr,Cs and Co, and the characteristics of the immobilization product. The experiments was carried out by contacting pure zeolite and ammonium zeolite with simulated waste which contain Sr,Cs and Co in a varied contact time. Immobilization of spent ammonium zeolite with a polymer is conducted in a varied waste loading, i.e.: 10, 20, 30, 40 and 50% weight. The characterization of the ammonium zeolite-polymer blocks was performed by the measurement of the density, compressive strength and leaching rate. The result, at the 90 minutes optimal contact time, showed that the ammonium zeolite sorption efficiency is higher than pure zeoliteâ€™s, in an order of Sr> Co> Cs. The characteristics of ammonium zeolite-polymer blocks was found to be the greater the waste loading the higher the density of the waste, as well as the compressive strength and the leaching rate. The best ammonium zeolite-polymer blocks were

obtained at waste loading of 20% weight, the blocks density of 1.3051 g/cm3, and the compressive strength of 9.68 kN/cm2. The presence of fission product leaching was not detected.