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Geopolymerization technology for manufacture of fly ash building brick in atmospheric temperature

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There is an increasing demand of building material industry due to industrialization and urbanization. The purpose of this research work is to develop innovative environment friendly building brick without any hot air curing and to study their performance, particularly on different critical condition. Considering the reaction path of geopolymerization process, a suitable alkaline activator has been developed with different $Na_2O/(Al_2O_3+SiO_2)$ of 0.025- 0.078 named as GeochemTM. The GeochemTM activator is an alkaline solution of sodium hydroxide and sodium silicate in presence of water consisting of Cl^- and $SO_4^=$ anions. The pH of the chemical activator consisting is above 11.5. The concentration of anion group chemicals in the activator is maintained depending on the chemical constitution of the oxides and silicates of aluminum, calcium, magnesium, iron bearing mineral phases. During this research work building brick of 230 × 110 × 75 mm size are manufactured. The fly ash mix consisting of $Na_2O/(Al_2O_3+SiO_2)$ ratio above 0.038 shows a remarkable increase in the strength. The strength gradually increases as the curing duration increases from 5 to 25 days. The substantial increase of strength of fly ash mix is due to the increase of alkali concentration and formation of alkaline alumino-silicate phases. The X-ray diffraction analysis data shows analcime, sodalite, cancrinite, natrolite, herschelite, and mullite, as predominant mineral phases. These mineral phases with different cation and anion substitution grow into amorphous to crystalline structures by dissolution and solidification. Inter-coordination of the polymerized minerals helps in the build-up of the binding strength.

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Boron selective adsorbent by radiation induced graft copolymerization of vinylbenzyl chloride onto nylon fibers followed amination

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A new boron selective adsorbent containing glucamine group was prepared by radiation induced graft copolymerization of vinylbenzyl chloride (VBC) onto nylon-6 fibers using electron beam irradiation followed by treatment with N-methyl-D-glucamine (NMDG). The degree of grafting (G%) in grafted fibers was tuned in the range of 10 - 130 % by variation of grafting parameters such as monomer concentration, reaction time and reaction temperature. The density of functional group attached to the poly (VBC) grafted fibers were varied from 1.0 to 1.7 mmol/g-adsorbent. The introduction of poly (VBC) grafts and subsequent chemical treatment was confirmed by scanning electron microscopy (SEM). The adsorption capacity of the adsorbent of 130 G % and 1.7 mmol/g-adsorbent was 13.5 mg-B/g-adsorbent. This value was found to be higher than that commercial Diaion CRB 03 resin which stands at an adsorption capacity of 11.5 mg-B/g-adsorbent. The obtained adsorbent seems to be a promising candidate for boron removal or recovery from solutions.

Biography

T M Ting was born in Sarawak/Malaysia in Sep 1976. He obtained his BSc and MSc in Environmental Science from Universiti Malaysia Sabah (UMS) in 1999 and 2002, respectively. He is currently a PhD (Chemical Engineering) candidate at Universiti Teknologi Malaysia (UTM). He is also a Senior Researcher at Malaysian Nuclear Agency. He is attached at Radiation Processing Technology Division, Malaysian Nuclear Agency since December 2001. He is involved in research and development in the field of functional polymeric materials, solid-liquid separation processes, pollutants decomposition using ionizing radiation, polymer modification and radiation-induced grafting techniques. To date he has published more than 10 articles in journals and proceedings at international and national levels.

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