

**PEMANFAATAN ABU VULKANIK GUNUNG KELUD SEBAGAI SUMBER SILIKA PADA PEMBUATAN FOTOKATALIS  $TiO_2/SiO_2$  DAN UJI AKTIVITASNYA UNTUK FOTODEGRADASI LIMBAH LAUNDRY**

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**INTISARI**

Pada penelitian ini telah dilakukan preparasi dan karakterisasi fotokatalis  $TiO_2/SiO_2$  menggunakan abu vulkanik sebagai sumber  $SiO_2$ , serta uji aktivitasnya untuk fotodegradasi surfaktan anionik dalam limbah *laundry*. Larutan natrium silikat dibuat dengan mereaksikan abu vulkanik dalam NaOH 5 M. Preparasi fotokatalis dilakukan dengan mereaksikan larutan titanium tetraisopropoksida (TTIP) 97% sebagai sumber Ti dalam etanol dan air dengan larutan natrium silikat, selanjutnya dikalsinasi pada suhu 400 °C selama 2 jam. Karakterisasi fotokatalis dilakukan menggunakan XRD, FTIR, SR-UV dan SEM terhadap energi celah pita (Eg) sebagai karakter fotokatalis. Proses fotodegradasi surfaktan anionik dalam limbah *laundry* dilakukan secara *Batch* melalui penyinaran di bawah sinar UV selama waktu tertentu. Analisis kadar surfaktan anionik sebelum dan sesudah fotodegradasi diukur dengan spektrofotometri UV/Visibel menggunakan metode *Methylen Blue Active Substances* (MBAS). Pada tahap ini, dipelajari pengaruh pH preparasi fotokatalis  $TiO_2/SiO_2$ , massa fotokatalis, dan waktu penyinaran terhadap efektivitas fotodegradasi surfaktan anionik dalam limbah *laundry*.

Hasil penelitian menunjukkan bahwa preparasi  $TiO_2/SiO_2$  menghasilkan komposit amorf dengan ukuran partikel lebih kecil daripada  $TiO_2$ . Proses fotodegradasi surfaktan anionik dalam limbah *laundry* dengan fotokatalis  $TiO_2/SiO_2$  berlangsung lebih efektif daripada  $TiO_2$ . Proses fotodegradasi surfaktan anionik dalam limbah *laundry* dengan  $TiO_2/SiO_2$  (pH 6) menghasilkan efektivitas fotodegradasi paling tinggi dibandingkan  $TiO_2/SiO_2$  (pH 3) dan (pH 9). Proses fotodegradasi limbah *laundry* dengan penambahan 50 mg fotokatalis  $TiO_2/SiO_2$  (pH 6) dapat menurunkan kadar surfaktan anionik secara maksimum yaitu sebesar 96,84% selama waktu penyinaran 24 jam.

Kata kunci: fotokatalis, abu vulkanik,  $TiO_2/SiO_2$ , fotodegradasi, surfaktan anionik.

**THE USE OF VOLCANIC ASH FROM MOUNT KELUD AS  $SiO_2$  SOURCE IN THE PREPARATION OF  $TiO_2/SiO_2$  PHOTOCATALYST AND ITS ACTIVITY ASSAY FOR PHOTODEGRADATION OF LAUNDRY WASTEWATER**

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**ABSTRACT**

Preparation and characterization of  $TiO_2/SiO_2$  photocatalyst using volcanic ash as a source of  $SiO_2$ , as well as its activity assay for photodegradation of laundry wastewater have been conducted. Sodium silicate formed by dissolving volcanic ash to NaOH 5 M. Preparation of  $TiO_2/SiO_2$  photocatalysts was carried out by reacting titanium tetraisopropoxide (TTIP) 97% solution as a source of Ti in ethanol and water, with sodium silicate, that was continued by calcination at 400 °C for 2 hours. Photocatalysts are characterized using XRD, FTIR, SR-UV and SEM the band gap energy ( $E_g$ ) as the character of photocatalysts. Photodegradation of surfactant anionic in laundry wastewater was carried out by batch under UV lamp for a periode of time. The concentrations of anionic surfactant before and after photodegradation were determined by spectrophotometry using Methylene Blue Active Substances (MBAS) method. At this stage, the effects of preparation pH of  $TiO_2/SiO_2$  photocatalyst, photocatalysts mass and exposure time on the anionic surfactant photodegradation were evaluated.

The research results showed that the preparation of  $TiO_2/SiO_2$  by using TTIP as  $TiO_2$  source and sodium silicate solution from volcanic ash of Mount Kelud has succesfully formed amorphous composites with smaller particles size than  $TiO_2$  photocatalyst. Photodegradation of anionic surfactants in laundry wastewater using  $TiO_2/SiO_2$  composite was more effective than by  $TiO_2$ . Surfactants photodegradation in the presence of 50 mg  $TiO_2/SiO_2$  (pH 6) show highest that is 96.84% of surfactant photodegradation followed by  $TiO_2/SiO_2$  (pH 3) and (pH 9), in 24 hours of the exposure time.

Key word: photocatalyst, volcanic ash,  $TiO_2/SiO_2$ , photodegradation, anionic surfactant