

BAB V

KESIMPULAN DAN SARAN

5.1 Kesimpulan

Berdasarkan penelitian yang dilakukan, dapat disimpulkan beberapa hal sebagai berikut:

1. Kinerja koagulasi limbah cair sintetik kongo merah menggunakan koagulan magnetik sangat dipengaruhi oleh pH limbah. Koagulasi hanya terjadi dengan baik pada pH 2 karena pada pH tersebut, kongo merah bermuatan positif (di bawah pH_{zc}) sedangkan protein yang terikat ke magnetit yang dimodifikasi asam tanin bermuatan negatif sehingga koagulasi terjadi dengan mekanisme penetralan muatan. Penurunan konsentrasi zat warna di pH 2 terjadi cepat di 5 menit pertama, sedangkan setelahnya cenderung konstan. Pada pH 3 – 5, penurunan konsentrasi zat warna cenderung meningkat seiring waktu, namun dengan *removal* yang rendah. Volume *sludge* yang diperoleh di pH 2 adalah 4 mL/L sedangkan pada pH 3 –5 tidak terbentuk *sludge*.
2. Peningkatan dosis koagulan magnetik pada koagulasi limbah cair sintetik kongo merah akan meningkatkan persentase pengurangan zat warna sedangkan volume *sludge* konstan. Semakin besar dosis koagulan magnetik yang digunakan, semakin banyak sisi aktif protein yang berikatan dengan koloid sehingga destabilisasi koloid terjadi. Peningkatan akan terjadi hingga titik kritik dimana penambahan dosis koagulan tidak akan meningkatkan aktivitas koagulasi lebih lanjut. Pada penelitian ini, diperoleh dosis terbaik 100 mg/L dengan persen *removal* mencapai 89,10% dan volume *sludge* 4 mL/L.
3. Peningkatan konsentrasi awal kongo merah pada koagulasi limbah cair sintetik kongo merah akan meningkatkan persentase pengurangan zat warna dan volume *sludge*. Semakin tinggi konsentrasi awal kongo merah, semakin banyak koloid bebas yang siap untuk berikatan dengan koagulan dan ketika koagulan diberikan, destabilisasi koloid akan terjadi. Peningkatan persen *removal* terjadi hingga titik kritik dimana penambahan konsentrasi awal kongo merah tidak akan meningkatkan aktivitas koagulasi lebih lanjut. Pada penelitian ini, diperoleh konsentrasi awal kongo merah terbaik pada 40 ppm dengan persen *removal* 96,66% dan volume *sludge* 25 mL/L.
4. Koagulasi menggunakan koagulan magnetik memiliki kinetika yang lebih cepat dibandingkan dengan ekstrak kasar protein saja. Pada koagulasi dengan koagulan

magnetik, waktu konstan dicapai pada menit ke-5 sedangkan pada koagulasi dengan ekstrak kasar protein, dicapai pada menit ke-35. Flok pada koagulasi dengan koagulan magnetik turun dengan bantuan gaya magnet dan gravitasi sedangkan flok pada koagulasi dengan ekstrak kasar protein turun hanya mengandalkan gaya gravitasi sehingga waktunya lebih lama. Model kinetika yang cocok pada koagulasi menggunakan koagulan magnetik pada limbah kongo merah adalah model *pseudo* orde 2 dimana adsorpsi yang terjadi adalah *chemisorption*.

5. Nilai *COD* pada koagulasi menggunakan koagulan magnetik mengalami penurunan karena kandungan organik dalam limbah ikut terendapkan membentuk *sludge*. Tetapi, *COD* meningkat ketika digunakan koagulan berupa ekstrak kasar protein akibat adanya kandungan organik dalam ekstrak kasar protein yang turut bercampur. Hal ini juga didukung dengan persentase pengurangan zat warna kongo merah dan volume *sludge* pada koagulasi menggunakan koagulan magnetik yang lebih besar daripada ketika menggunakan ekstrak kasar protein saja.

5.2 Saran

Berdasarkan penelitian yang dilakukan, disarankan agar:

1. Perlu dilakukannya analisis lebih lanjut sehubungan kapasitas adsorpsi protein pada besi modifikasi asam tanin untuk mengetahui kinerjanya dibandingkan dengan besi modifikasi asam sitrat pada penelitian sebelumnya.
2. Perlu dilakukannya analisis jumlah asam tanin yang berhasil teradsorp pada permukaan besi.

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