Analisis korelatif pengaruh medan magnet terhadap karakteristik nyala api aliran bahan bakar LPG-Udara coaxial = Correlative analysis of magnetic field effects on LPG air coaxial flame characteristics

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Abstrak

Pengaruh gradien medan magnet negatif terhadap nyala api aliran bahan bakar LPG-udara coaxial telah dipelajari untuk memahami interaksinya. Sebuah medan magnet gradien negatif tidak seragam yang dihasilkan oleh elektromagnet dari arus listrik searah 0 hingga 0,25 T diberikan diantara burner. Kecepatan aliran udara dan LPG serta intensitas medan magnet divariasikan untuk diketahui pengaruhnya tehadap karakteristik nyala api. Pengaruh gradien medan magnet negatif terhadap karakteristik nyala api seperti temperatur, tingkat kecerahan, panjang, luas, dan jarak lift-up yang dihasilkan dari proses pembakaran telah dipelajari. Temperatur, panjang nyala api, tingkat kecerahan dan jarak lift-up diketahui terpengaruh oleh laju aliran bahan bakar, udara dan intensitas medan magnet. Sementara itu, luas nyala api cenderung tidak berubah terhadap perubahan medan magnet. Panjang nyala api berkurang seiring dengan bertambahnya laju aliran udara dan intensitas medan magnet. Begitu pula dengan jarak lift-up yang berkurang seiring dengan bertambahnya kuat medan magnet dan bertambah seiring dengan penambahan laju aliran udara. Temperatur dan tingkat kecerahan nyala api meningkat seiring dengan bertambahnya gradien medan magnet. Korelasi tinggi nyala api terhadap parameter-parameter yang mempengaruhi diperoleh : 𝑙𝑛(𝐿𝑓𝑑)=−0,0292+ 0,5002 .ln(𝑅𝑒𝑢𝑑𝑎𝑟𝑎)+0,2647 .ln(𝑅𝑒𝑏𝑎ℎ𝑎𝑛 𝑏𝑎𝑘𝑎𝑟)+0,1469 .ln (𝐺𝑟𝑚) <hr>The effect of a negative gradient magnetic field on LPG-air coaxial flame has been systematically studied to comprehend its interaction. A non-uniform negative gradient magnetic field was produced in the air gap of the burner by an electromagnet which is powered by direct current power supply producing 0 to 0,25 T magnetic field. Magnetic field intensity, air and LPG flow were set in various condition to to understand its effect to flame characteristics. The influence of negative magnetic field gradient to characteristics of the diffusion flame, such as the temperature, brightness, flame length, area and lifted distance produced by the flames have been thoroughly investigated. The flame length, temperature, brightness and lifted distance were found to be influenced by air-LPG flowrate and magnetic field intensity. Meanwhile, the flame area remained constant with the presence of the vertically decreasing gradient magnetic field. The flame length and lift-up distance of the flame reduced when the magnetic field gradient increased. Meanwhile, the flame temperature and brightness increased with the increasing of magnetic field gradient. Correlation between flame length and non dimensional number obtained : 𝑙𝑛(𝐿𝑓𝑑)=−0,0292+ 0,5002 .ln(𝑅𝑒𝑢𝑑𝑎𝑟𝑎)+0,2647 .ln(𝑅𝑒𝑏𝑎ℎ𝑎𝑛 𝑏𝑎𝑘𝑎𝑟)+0,1469 .ln (𝐺𝑟𝑚)