

## Studi sintesis komposit hibrids zeolit termodifikasi kation logam transisi $\text{Cu}^{2+}$ sebagai sensor gas amonia = Studying synthesize of zeolite hybrid composite that modified with $\text{Cu}^{2+}$ transition metal cation acts an ammonia gas sensor

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### Abstrak

Komposit hibrida zeolit NaY/ZSM-5 telah berhasil disintesis pada permukaan kaca kuarsa. Mula-mula kaca kuarsa dimodifikasi dengan Au/Ag. Lapisan ini kemudian digunakan sebagai salah satu komponen elektroda sekaligus sebagai adhesif untuk merekatkan kaca kuarsa dengan material lain. Pembuatan komposit hibrida zeolit diatas permukaan kuarsa dilakukan dengan sintesis zeolit ZSM-5 secara hidrotermal kemudian dilakukan elektroforesis di permukaan kaca kuarsa. Lapisan zeolit kedua (NaY) dibuat dengan teknik redispersi bubuk zeolit NaY hasil sintesis dengan metode seeding, pada lapisan ZSM-5. Kemudian modifikasi kation logam  $\text{Cu}^{2+}$  dilakukan dengan teknik dip-coating selama 24 jam pada suhu ruang. Pengujian sebagai sensor gas amonia dilakukan dengan teknik impedance pada rentang frekuensi 20kHz - 20 Hz untuk konsentrasi amonia dari 0 - 250 ppm. Pengukuran dilakukan terhadap variasi dari modifikasi lapisan IDC.  $\text{Cu}^{2+}/\text{NaY}/\text{ZSM-5}/\text{IDC}$  memberikan performa sensor terbaik pada frekuensi 20 kHz, yang dalam hal linieritas dapat dicapai pada rentang konsentrasi 10 - 250 ppm  $R^2 = 0,978$ .

.....A hybrid of NaY/ZSM-5 zeolite has been successfully synthesized on the surface of quartz. The quartz was initially modified by Au/Ag layer, which then acted as a component of electrode as well as an adhesive layer provided the modification with other materials. Preparation of the composite on the quartz surface was performed by hydrothermal synthesis of ZSM-5 followed by electrophoresis technique at the quartz surface. The second layer of zeolite NaY has been prepared by redispersion of zeolite powder, which is synthesized using seeding method, on to ZSM-5/Au/Ag surface. Then, modification of  $\text{Cu}^{2+}$  ions was performed by dip-coating method for 24 hours at room temperature. The examination for ammonia sensor was conducted using impedance analyzer in the frequency range of 20 kHz - 20 Hz for ammonia concentration range of 0 - 250 ppm. The measurements were conducted on various types of IDC layers modification.  $\text{Cu}^{2+}/\text{NaY}/\text{ZSM-5}/\text{IDC}$  showed the best performance at the frequency of 20 kHz, in which Linearity in the concentration range of 10 ppm - 250 ppm ( $R^2 = 0.978$ ) can be achieved.