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A SUPPORTED TITANIUM BASED CATALYST FOR *IN-SITU* HYDROGEN SULPHIDE DESULPHURIZATION AND CARBON DIOXIDE METHANATION REACTION IN NATURAL GAS

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ABSTRACT
Malaysian crude natural gas contains various gases components including methane (40-50%), ethane (5-10%) and propane (1-5%). However, this crude natural gas also contain H_2S (1–5%) and CO_2 (20-30%) which have the ability to corrode carbon steel used in the natural gas pipeline system and material in the processing plant. $Fe^{3+}/Zn^{2+}/Cu^{2+}/Ti^{4+}/Al_2O_3$ with the ratio 0.1:0.1:0.8:1 was prepared to produce the best catalyst for *in-situ* reaction of H_2S desulphurization and CO_2 methanation. This catalyst was produced via modified sol-gel and impregnation methods and was calcined at $400^{o}C$ for 5 hours. The results of catalytic activity testing for the $Fe^{3+}/Zn^{2+}/Cu^{2+}/Ti^{4+}/Al_2O_3$ showed H_2S desulphurization percentage of 100% and 0.9% methanation at aworkable plant reaction temperature of $100^{o}C$. This catalyst also had the lowest of H_2S adsorption with 1.9% at the range of room temperature to $40^{o}C$ and it also could oxidize the highly concentration of H_2S with 94.3% at the low temperature of $40^{o}C$. Importantly, this catalyst could be regenerated via heating at $200^{o}C$ for 3 hours under compressed air flow at the rate of $100mLmin^{-1}$. The XRD analysis only showed the present three peaks due to cubic phase of γ-Al_2O_3. The Ti, Cu, Zn and Fe elements present in the catalyst matrix system were presumably to be homogeneously dispersed on the surface of alumina support besides their presence in very low concentration. The SEM micrograph showed that this catalyst had homogeneous size particles.

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