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|  |  |  הטכניון - מכון טכנולוגי לישראל TECHNION - ISRAEL INSTITUTE OF TECHNOLOGY  |
| הפקולטה להנדסה כימיתע"ש וולפסון |  |  |
| The Wolfson Department of Chemical Engineering |  |  |

**Wolfson Department of Chemical Engineering Seminar**

**Monday, August 19th, 2024 at 14:00**

**Zoom:** https://technion.zoom.us/j/96298325147

**Catalytic Decomposition of Plastics with Iron and Aluminium Oxide Catalysts for Hydrogen Production**

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**PhD mid-seminar**

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The production and consumption of plastics have become an indispensable aspect of modern society. High-density polyethylene (HDPE) was subjected to pyrolysis and then catalytic upgrading to produce hydrogen in the presence of a novel Fe2O3/Al2O3 catalyst with a grain boundary. The hydrogen yield with Fe2O3/Al2O3 was 50.53 mmol⋅g-1plastic and alkanes/alkenes ranging from C2 to C9 dominated the hydrocarbon products. The grain boundary between Fe2O3 and Al2O3 enhanced the adsorption of gaseous products. Catalyst-support interaction to form FeAl2O4 during the pyrolysis reaction was responsible for effective proton adsorption and C–H bond cleavage. The intrinsic catalytic activities of tetrahedral and octahedral iron among Fe3O4@biochar, Fe2AlO4@biochar and FeAl2O4@biochar were further explored, and the tetrahedral iron sites in FeAl2O4@biochar more effectively converted PP pyrolysis vapors and achieved hydrogen yields of 61.58±0.29 mmol g–1plastic. Four gases, namely CH4, C2H4, C3H6 and (E)-2-C4H8, were selected as model compounds to study the mechanisms involved. The used FeAl2O4@biochar catalyst was then employed in a zinc-air battery, attaining a power density of 77.4 mW cm–2, an energy density of 714.2 mAh gZn−1 and a durability of 300 h.