Effect of electromagnetic energy on net spin orientation of nanocatalyst for enhanced green urea synthesis

Catalytic activity of nanomaterials under applied electromagnetic field is a green method which is based on change in spin orientation of nanocatalyst. However, interaction of magnetic and dielectric nanocatalysts with electromagnetic field is not well understood. Here, we propose a kinetic model utilizing electromagnetic field effect on activation energy. This field causes weakening of the bond of the reactant molecules and reduction in activation energy of nanocatalysts. The underlying mechanism is singlet to triplet conversion with the change in spin orientation of gases and nanocatalysts at ambient condition. The results show that saturation magnetization and net spin of Fe_3O_4 nanocatalysts are higher than ZnO nanocatalyst by 6,764 and 56 times, respectively. Hence, 36.60% reduction in activation energy and 9.70% increase in rate constant for Fe_3O_4 results in 566.87% increment in urea yield. These findings will pave the way for a new insight on electromagnetic application for industrial chemical reaction.

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