CHARACTERISTICS OF OPERATING MODE IN A ROTATING ARC AND OPTIMIZATION OF CHEMICAL PROCESS BY CONTROL OF THE MODE

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In a typical gliding arc reactor, the arc string expands two dimensionally. Compared to the gliding arc, rotating arc reactor can expand arc string three dimensionally by rotating flow of reactant within reactor resulting in volumetric highly thermal environment favorable for the chemical reaction such as thermal decomposition or oxidation process. The expansion of arc not only enlarges chemically active volume but also enhances efficiency of power usage by arc for the process. High efficiency of power usage is due to the fact that the rotating arc can sustain expanded state of arc with rotating movement without repetitive expansion process from short arc to longer arc.

Rotating arc in this presentation is scale-up model of rotating arc that has capacity of flow rate with hundreds of liter per minute. The reactor has throat structure in downstream part of the reactor that is crucial for expansion and anchoring of arc string.

Proposed reactor produces there are different modes of arc generation. And each mode has different characteristics of arc generation. Arc length, anchoring and efficiency of power consumption is determined by the mode. Most importantly, the efficiency of the chemical process can be controlled by operating with optimum mode of arc generation.

The analysis on the mode of arc generation is directly connected to the optimization of chemical process and in this presentation an efficiency of decomposition of NH3 according to the mode of operation is explained. Using the concept of mode, higher efficiency of removal up to 97% with less electric power of 0.9kJ/L was obtained without any additive.