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# Numerical Modelling of Off-gases during Carbonization of Carbon Fibers

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## Extended Abstract

Carbon fibers are now commonly used in industrial fields such as aerospace industries, automobiles, and wind power plants because they are light in weight due to their low density and high specific strength. Recently, attempts have been made in electric and electronic components to utilize not only their light weight but also the characteristics such as low thermal expansion rate, high electrical and thermal conductivity.

In general, carbon fibers are prepared through a process of removing other elements except for carbon from precursors such as polyacrylonitrile (PAN), pitch, rayon, or polyimide (PI). PAN-based carbon fibers occupy a market share of about 90% because of high carbon yield as well as its ease to make high-performance carbon fibers. Recently, polyimide is in the spot light owing to its own stability to thermal load and high thermal conductivity. It is possible to shorten or omit the stabilization process when precursors having proper characteristics. Studies [1, 2] about polyimide precursors have published in decades. However, researches about carbon fiber manufacturing process using polyimide are not easy to find. In this study, a numerical analysis model was established to analyze the carbonization process during the carbon fiber manufacturing process using polyimide. In order to analyze heat and mass transfer phenomena during the process, a mathematical model for the off-gases from the polyimide precursor fibers was developed based on the experimental results by Inagaki [3]. And then the carbonization of the polyimide precursor fibers in the circular furnace has been analyzed using the analysis model. Numerical simulation results using the model have been obtained and compared to the experimental results in order to verify the model. The results show that the model can be used to study carbonization processes using polyimide precursor.

## References

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