Abstract of Doctoral Thesis

Title：Explosion of Scientific Knowledge Caused by Process Innovation

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Despite the attention technological process innovation of high tech product development draws in the natural sciences, the process innovation literature does not address the way underlying scientific theory makes possible new process innovations that lead to the development of successful new products. This paper focuses on process innovation that is derived from the latest scientific theory.

Using bibliometric data on two new compound semi conductive materials, gallium nitride(GaN), and zinc selenide(ZnSe) used in the development of blue light-emitting diodes, our study indicates that there exists the explosion of scientific knowledge behind the success of GaN development research where the explosion is observed by a rapid increase of cumulative numbers of published papers during the early region of a logistic curve. One of the factors for the explosion is attributed to technological process innovation shaped by latest scientific theory. In contrast, there is not the explosion of scientific knowledge behind ZnSe development research where cumulative numbers of published papers increases lineally and gradually. In addition, the process innovation shaped by latest scientific theory is not observed. Our findings show that the process innovation possibly determines innovation process of product development. Then the properties of process innovation are discussed.

In order to confirm whether similar trend appears in specialties different from blue light-emitting diodes, development of amorphous silicon solar sell and extreme-ultraviolet lithography are also investigated.