Bibliometric Analysis of Photocatalytic CO_2 Reduction

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The CO_2 concentration levels in the atmosphere have exceeded 400 ppm in March of 2014. That has been reported as a milestone with 40% increase from 1750s [1] and the global CO_2 concentration level will be expected to rise at around 2 ppm per year [2]. Therefore, the efforts for limiting atmospheric CO_2 concentration have been gaining lots of interest from scientific and commercial communities. Whereas scientists are pioneering novel technologies and products, industrialists try to convert them to practical and economical applications. The investigation of the patterns in scientific and commercial works and the relationship between them may help to assess future trends and provide new pathways for future scientific or commercial endeavors. To contribute to these efforts, a bibliometric analysis of photocatalytic CO_2 reduction was performed through scientific and commercial databases.

In the first step, the topic of photocatalytic CO_2 reduction was searched in the Web of science core collection (WOS) database via "photocatalytic CO_2 reduction" and "photocatalytic carbon dioxide reduction" keywords for the last 32 years (9731 publications). Then, the commercial trends in this area were sought by Google Patents for the last 9 years (15898 patents). The numbers, types, document types, research areas, and common keywords of scientific publications were associated with each other. At the same time, the database of patents in the last 9 years was pre-processed and ready for revealing the link between scientific publications. The relationship between scientific publications and the patent number was demonstrated via NodeXL in a node structure.

Publications (9731) during the last 32 years under the topic of photocatalytic CO_2 reduction were sorted out and categorized into four types; C:conferences, Symposium and Research Workshop (99), J: Journal (9529), B:Book (23), and S: Book in Series (70) (Fig. 1a). The annual number of journal publications, which overwhelmingly the largest type of publication, was sub-categorized into research (86%) and review (14%) article types to understand the kinds of journal sources.

The number of patents in the last 9 years was also imported and structured in a suitable form to compare with the publications number in the same years. The scientific impact on the patent number was also studied in the point of research areas similarities by NodeXL (Fig. 1c). In addition to publications and patents; social media coverage was also investigated to see the changing trends in the field with time.

The type and focus of the studies were also analyzed through keyword analysis while the most commonly studied materials and methods (as well as the most effective ones) were also analyzed using the database constructed from published literature.

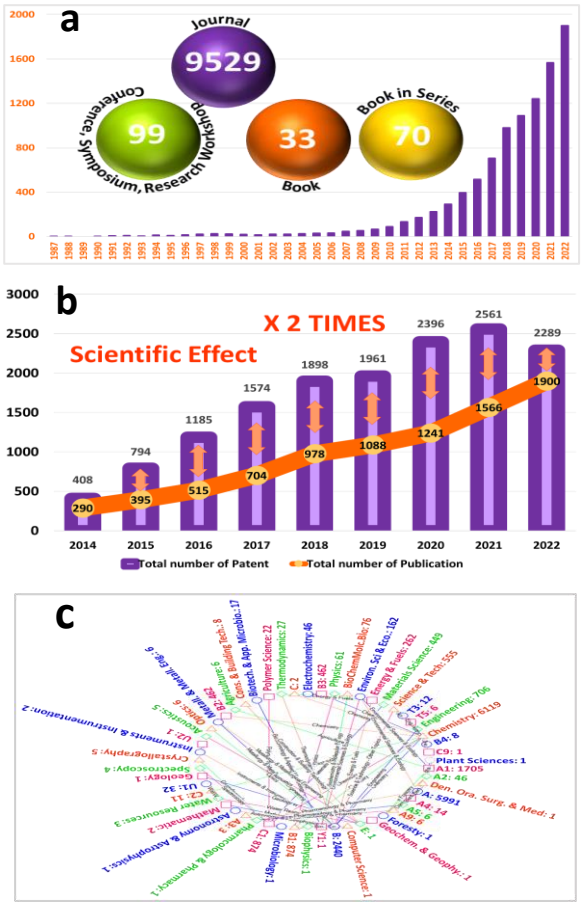

Figure 1. (a) The number of publications in WOS during the last 32 years, (b) comparison of numbers of patents and scientific publications during the last 9 years (c) relations between the research areas of publications and patents

References

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