

BIBLIOMETRICS ANALYSIS OF THE RESISTANCE OF STEEL MATERIALS IN BUILDING STRUCTURES TO FIRE

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ABSTRACT

Fire is the out-of-control burning method of flammable substances, which includes wood, paper, plastic, fuel, or different substances, which produce heat, mild smoke, and toxic gases. Fires can occur, including woodland fires caused by lightning or because of human activities, along with building fires due to electric short circuits or errors in the use of fire. In building design, it is miles vital to apprehend the elements that cause fires and the fireplace's resistance to materials. Metal is a form of metallic made from a primary mixture of iron (Fe) and carbon (C), with the amount of carbon typically being much less than 2 per cent of its general weight. Steel is a very common fabric used in a spread of applications due to its aggregate of robust, long-lasting, and malleable properties.

Keywords: *Fire, steel, materials, human activities*

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INTRODUCTION

This fire is a very destructive disaster. Unfavourable to residing creatures, adverse to building structures, and so on. Hearth is one of the most frequent screw-ups and threatens network protection and ecological balance. Warmth maps have been used as a not-uncommon visualization technique in many scientific fields; however are rarely utilized in fireplace threat evaluation (Liu et al., 2019). Natural disasters are an inseparable part of our time and occur when we least expect them to happen to us (Dhall et al., 2020). Fires that we regularly encounter in our environment encompass stoves left unattended, electric short circuits, smoking in irrelevant locations, risky chemical products, criminal acts, and lightning that may cause woodland fires. Hearth takes place due to a chemical response referred to as combustion (Rosalina et al., 2019). Combustion is an oxidation response that occurs when fuel (normally combustible substances together with timber, paper, or fuel) reacts with oxygen inside the air under certain conditions. (Syuhada et al., 2022) A number of the factors that cause fire to burn or are worried within the combustion response are gas, which is a material that could burn, such as wood, paper, plastic, oil, or gas.

Even li-ion-type batteries. Lithium-ion (Li-ion) batteries are becoming more commonplace in mining to provide energy (Yuan et al., 2020), and their high electricity density represents a main technological and aid achievement for humanity (Christensen et al., 2021). therefore, we need growth insight regarding the want to enhance fire protection control of local health facilities (Muhamad et al., 2020). Oxygen in the air is the primary thing that helps combustion. In the combustion reaction, oxygen reacts with the gas, producing heat and gases consisting of carbon dioxide (CO₂) and water (H₂O). Fireplace hazards in buildings may be described because of the capability for unintentional or intentional fires, which could threaten

the protection of life, shape, and belongings in a construction (Kodur, Kumar, & M, 2020) Initial warmness is needed to attain a temperature referred to as the flash factor, in which the gas starts to release flammable gases. This process will hold as long as fuel, oxygen, and heat are to be had and could be prevented when one of the elements of the fire Triangle is removed. (Marfuah, Casban, Sunardi, & Dewi, 2021) natural disasters are an inseparable part of our time and arise while we least count on them to happen to us (Dhall et al., 2020). For fire, explosion, and toxic leak injuries, Previous models of damage analysis and consequence evaluation have been developed by others. But any model's direct software will inevitably bring uncertainty. Resulting from ignoring interactions between accidents (He & Weng, 2020). Fires are also the most common coincidence at natural gas facilities (Hosseini et al., 2020).

For unstructured and careless settlements, fires can effortlessly spread quickly via the location, causing heaps of human beings to lose their houses in a single fire. (Walls, Eksteen, Kahanji, & Cicione, 2019) Most towns around the world are experiencing gentrification as excessive profits and inexperienced persons pressure up domestic fees and displace older, lower-earning citizens. (Pennington, 2021). The rapid increase in the use of advanced lightweight materials, inclusive of mild alloys, polymers, and highly flammable fiber-bolstered composites, poses large fire risks that impact human beings, The economy, and sustainability (Chen et al., 2019). Fire outbreaks are a severe risk due to the encompassing surroundings and dynamic environment of the vicinity (Sousa et al., 2019)

A comprehensive fire threat evaluation is mainly crucial in dense city areas because it could offer an estimate of the human beings and property at risk. The distribution of fire hazards in city groups is primarily a political difficulty (Rush et al., 2020). The impact of a fire on a concrete shape will cause numerous troubles, such as a decrease in the energy of the concrete to help the burden.

In this condition, three possibilities occur within the electricity of the structure, which affects the subsequent remedy of the structure. The three possibilities are: the shape continues to be able to withstand the existing load as within the initial design, the structure is repurposed for other purposes consistent with the weight it can resist, or the structure desires to be completely renovated. (Ariyanto & Edison, 2022)

Beams and columns, as crucial structural components, can also be affected by the fireplace with the purpose of, in the end, facing the three opportunities above. The consequences of the heart on constructing construction include decreased concrete first-class. Reduced concrete energy value. Damage of metal in concrete, which bureaucracy reinforcement. Loss of adhesion to metallic ties and reinforcement. Taking pavement (spalling). Metallic curve. Because of the warmth of the fire, the bond between the concrete components is destroyed. (Pribadi, 2019).

METHOD

Based totally on this research, the method used is identifying studies journals from networks, data, and developments with parameter standards which can be according to the study subject matter, namely the resistance of metal substances to the hearth. By utilizing a generation that has evolved, facts can be acquired easily through the use of awareness from numerous research resources in the arena. In this case, the research will use bibliometrics evaluation to map the literature overview and facts wished.

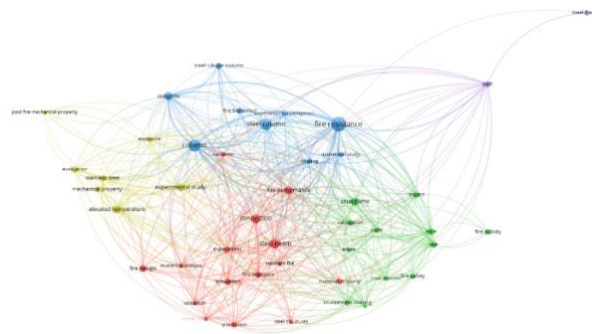
Bibliometrics evaluation ambitions to offer a visualization of associated, famous networks and research that continues to develop from year to year. The effects of the bibliometrics evaluation mapping will later be reviewed from the visual form of the community, period, to the density that's processed in graphical shape and information details. The information accrued will be modified within the shape of visualized pictures and graphs with quantitative information processing. The relationship between analysis and quantitative methods could be very significant because this research requires facts so that it will produce numbers.

RESULTS AND DISCUSSION

This bibliometrics evaluation research process records using a database generated from the submit or Perish utility. This database is the result of an overview of diverse key phrases blanketed, such as fire, steel, materials, and human activities. To similarly ensure the suitability of the evaluated results produced, this research also decided on key phrases produced through the publish or Perish application to produce research that was most related to the theme of this research. This database is processed to conclude the prevailing findings.

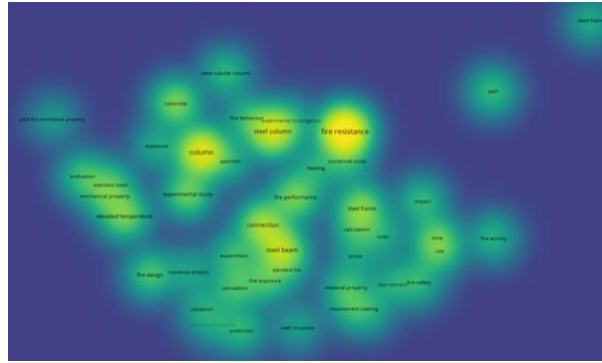
The statistics produced in this assessment method may be very much wanted inside the system of processing consequences and concluding. Subsequently, the information is processed to make graphs, photos, and tables using the Microsoft Excel application. Apart from records from publish or Perish of the direction, it would help if you had the outcomes of an overview of the VOS viewer utility to see the connection, density, and distribution of studies' key phrases.

From picture 1, quite a lot of fire resistance and steel column journals are still conducting research. Moreover, what is widely discussed are cases that often occur, namely fires, whether in forests, building structures, houses, or anywhere. For fire resistance, many researchers have conducted research on how to prevent fires, prevent fires from occurring, and what materials are suitable to overcome them.



Picture 1. Bibliometrics about material resistance with vos viewer

Search results using the VOS viewer application are dense between research keywords. These outcomes were received from the Vos Viewer software to look at the attention and density of the chosen keywords (picture 2). With previously entered key phrases along with fire, steel, material, and human activities, it is clear that the density degree of the resulting keywords varies. It can be seen that the keyword fire resistance is the most dense and concentrated keyword.

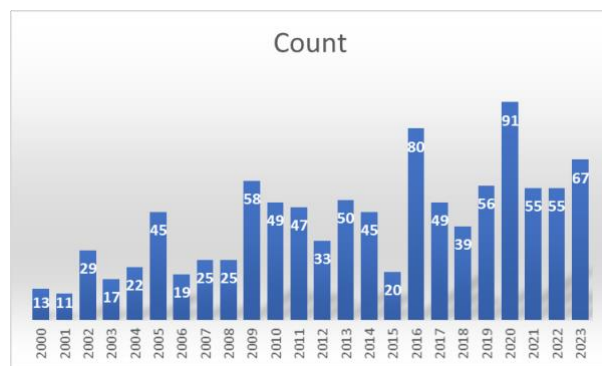


Picture 2. Visual keyword density research

Which shows that the keyword is intently related to the research topic. Different keywords additionally explain the lifestyles of attachment to the research subject matter; however, they have different degrees of density. The steel column and column are quite dense and indicate that there are still many researchers researching this keyword, which shows that the keyword is intently related to the research topic. Different keywords additionally explain the lifestyles of attachment to the research subject matter; however, they have different degrees of density. Steel column and column are quite dense and indicate that there are still many researchers researching this keyword.

The database produced by the publisher or Perish utility can see the distribution of research years. These records are then processed with the use of Microsoft Excel software to provide the following graph (picture 3). This data is converted into a chart to look at the years wherein the most studies were performed on the subject. Consequently, this chart can be effortlessly located concerning research trends from 2000 to 2023.

Based totally on the chart (picture 3) it explains the distribution of a thousand research studies that occurred within the period 2000 to 2023. From 2015 to 2016, there was a drastic increase in this research, and the statistics show that 2020 was the best year in terms of the variety of studies, with 90 studies. The upward thrust and fall of the number of studies primarily based on the following year’s durations concludes that there may be a research trend that continues to expand over time.



Picture 3. Chart of distribution of research years

CONCLUSION

Research on the Bibliometrics analysis of the resistance of steel materials in building structures to fire with Publish or perish and vos viewer analysis. Just using this application shows that technology in the world is increasingly advanced. In the past, we had to search for

journals manually, and this took much time. By using this application, 1000 studies were obtained in 23 years, in less than 3 minutes. Very helpful in writing this journal. Research results were obtained with the help of this application. With the previously entered key phrases along with fire, steel, material, and human activities, it is clear that the density degree of the resulting keywords varies. It can be seen that the keyword fire resistance is the most dense and concentrated keyword. Distribution of 1000 research studies that occurred within the period 2000 to 2023. From 2015 to 2016, there was a drastic increase in this research, and the statistics show that 2020 was the best year in terms of the variety of studies, with 90 studies.

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