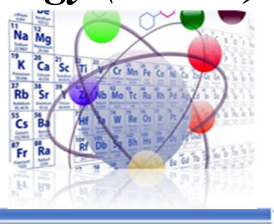
Indonesian Journal of Chemical Science and Technology (IJCST)
State University of Medan, https://jurnal.unimed.ac.id/2012/index.php/aromatika

IJCST-UNIMED 2023, Vol. 06, No. 1 Page; 45-55
Received : Dec 24th, 2022 Accepted : Jan 1st, 2023 Web Published : Jan 31st, 2023



Bibliometric Analysis on Scholarly Journals of PVA Hydrogel Membrane Using VOSviewers Software

Vizny Grace Irene Damanik, Asep Bayu Dani Nandiyanto*

Chemistry Department, Indonesian University of Education, Bandung, Indonesia)
**Corresponding author :* nandiyanto@upi.edu

ABSTRACT

The development of technology in this world is already developing rapidly. One of the advanced technologies that support research planning is bibliometrics. This study aims to analyze the scope of research on PVA Hydrogel Membrane using VOSviewer using bibliometric review with a mapping process to ensure that the research to be carried out has never been studied and knows the relationship of each related item. The three processes underlying the search use the keywords "chemistry, particle, PVA, and Hydrogel" namely title, abstract, and keyword. The research database is taken from google scholar. A total of 98 articles are relevant and meet the criteria. The results show that most of the studies were conducted in the 2012-2022 range. PVA and Hydrogel are so closely related to each other that they have a fairly bright density visualization. Some items are not related to the PVA Hydrogel Membrane but these items are interconnected with other items so it can be concluded that there are still many items that can be used for further research.

Keywords: bibliometrics, chemistry, PVA, hydrogel, VOSviewers.

1. INTRODUCTION

A substance is something that has mass and occupies space. Substances are composed of very small particles that cannot be seen by the naked eye. The arrangement and nature of particles of each substance are different. The arrangement and nature of particles largely determine the form of the substance. Particles are the smallest part of the matter. In principle, there are three types of substances, namely solid, liquid, and gas. Particles have chemical properties and physical properties.[1]

The influence of particle size in the world of the chemical industry is very large. Researchers who conduct research cannot be separated from things about particles, especially in the field of chemistry. The material composed of such particles can be analyzed by technology. In recent years, Controlled Release Fertilizer (CRF) has been considered the most suitable method to improve efficiency, reduce loss of nutrient

e-ISSN : 2622-4968, p-ISSN : 2622-1349

particles, and reduce the effects of contamination onthe environment. The matrix that is often used in CRF is a hydrogel.

The main nutrients needed by plants are nitrogen (N), phosphorus (P), and potassium (K). An inadequate supply of any nutrients during plant growth will harm the reproductive ability, growth, and yield of plants.[2] CRF can increase the availability of nutrients due to the controlled release of nutrients into the "binding" medium during the fixation processin the soil as well as supply nutrients in the form preferred by plants, in which way the synergistic effect between the nutrients in CRF is enhanced. The hydrophilic properties of hydrogels are caused by the influence of the presence of the
–OH, -COOH2, and SO3H groups. While the insolubility in water and the ability to maintain its shape is influenced by the three-dimensional structure of the hydrogel that can hold water and regulate structural degrees and elasticity.

In addition, Poly (Vinyl Alcohol)/PVA, is a synthetic polymer that is soluble in water due to its hydroxyl group. PVA is generally produced by free radical polymerization and subsequent hydrolysis of PVA results in a fairly wide molecular weight distribution. PVA degrades easily in the environment, where degradability is highly dependent on the number of hydroxyl groups.[3]

According to Rahmawati (2011), a membrane is a thin layer that is used to separate two phases and serves as a selective barrier to the displacement of material. In general, membranes are always involved as a medium for mass transfer in the permeation process. Permeation is a process of mass transfer in which molecules are transferred through a polymerfrom the exterior environment to the interior environment or vice versa by a diffusion process.

Many researchers have researched particles and Hydrogel PVA. One of the studies that Liu et al (2020) have conducted, namely the sound absorption properties of spiral vane electrospun PVA / nanoparticle nanofiber membrane and non-woven composite material, and also research that Wang (2021) has carried out hydrogel synthesis using PVA and borax. PVA or poly (vinyl alcohol) is a hydrophilic polymer that is generally used as a biomaterial material because it is non-toxic, non-carcinogenic, has biocompatibility, and high hydrophilicity properties, but no one has discussed the analysis of PVA hydrogel membrane with bibliometric analysis with a mapping process using VOSviewers. Bibliometricanalysis is an important method to analyze related studies in various fields, and it has been increasingly used to assess research.[4] So that a comprehensive study is needed so that it can be used to assist other researchers in planning research related to PVA hydrogel membrane. Researchers can then examine the PVA hydrogel membrane particle section extensively.

VOSviewer is software for building and visualizing bibliometric networks. These networks for example can include journals, researchers, or individual publications, and they can be built on citations, bibliographic merging, co- citations, or co-authoring relationships. VOSviewer also offers text mining functionality that can be used to build and visualize a network of shared events from important terms extracted from the scientific literature.[5]

This study aims to determine the development of research related to PVA hydrogel membrane in chemistry and educational research in terms of bibliometric analysis and research trends using VOSviewers. The distribution of the bibliometric mapping displayed consists of the type of publication, the field of the topic under study, the country of originof the researcher, the journal in which the publication was published, and the language used.

e-ISSN : 2622-4968, p-ISSN : 2622-1349

2. RESEARCH METHOD

All articles analyzed in this study are taken from the Google Scholar database. Google Scholar provides services such as information in the form of PDF (Portable Document Format) completely and free of charge. In general, Google Scholar is used by students to find references for making scientific papers.[6]

This research was conducted by collecting all publications in predetermined journals. After that, the data will be analyzed to make it easier to plan research. This research was conducted by online search with the keywords "chemistry, particle, PVA, Hydrogel" according to the criteria, namely title, abstract, and keywords with restrictions published in the 2012-2022 range. In this study, articles that have been collected and meet the criteria for analysis are then entered into the Microsoft Excel software and saved in the (*.ris) format. furthermore, VOSviewers will analyze and evaluate the trend data that has been inputted in the form of bibliometric mapping visualizations from database sources. Then, verification of terms can be chosen for less relevant words from what will be studied. Figure 1 presents the flowchart for bibliometric analysis.

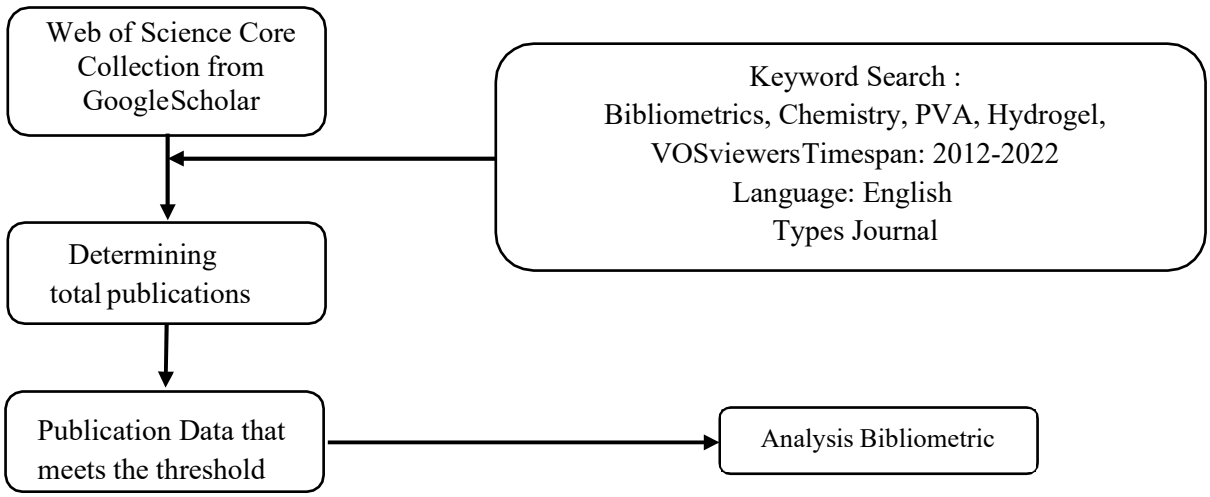


Figure 1. Flowchart of Literature Selection

3. RESULTS AND DISCUSSION

Based on the search results of the google scholar database obtained, several scientific data on the minimum number of occurrences of a related term there are 10 out of 5866 terms, and 98 that meet the threshold criteria. In this study, the articles used were articles published in the 2012-2022 range. In 2012 there were 33 articles, in 2013 there were 41 articles, in 2014 there were 44 articles, in 2015 there were 62 articles, in 2016 there were 57 articles, in 2017 there were 57 articles,
in 2018 there were 78 articles, in 2019 there were 131 articles, in 2020 there were 174 articles, in 2021 there were 190 articles, and in 2022 there are 133 articles. Figure 2 shows that every year there is an increase in the publication of articles.

e-ISSN : 2622-4968, p-ISSN : 2622-1349

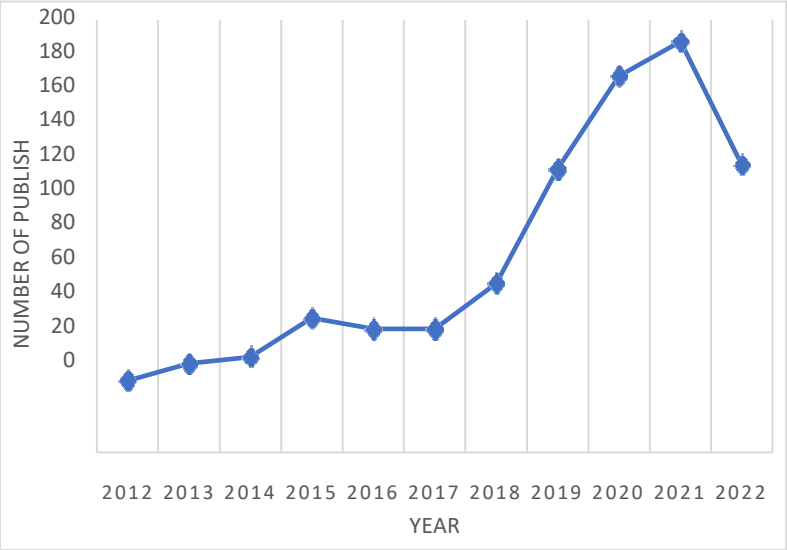


Figure 2. Graphic of Publication Numbers in 2012-2022

Bibliometric analysis is a popular method for exploring and analyzing several scientific data.[7] The data obtained is in the form of the author's name, title, year, journal name, publisher, the number of citations, article links, and related URLs.[8] Table 1 shows some examples of published data used in the VOSviewer analysis of this study. The sample data taken is the 10 best articles that have the highest GS Rank. The number of citations from all articles used in the study was 607.

Table 1. Top 10 Of Publication PVA and Hydrogel

No	Author	Title	Publisher	Cites	Rank
1	H Zhang, J Liu, F Shi, T Li, H Zhang, D Yang	A novel bidirectional fast self-responsivePVA-PNIPAM/LimCsnWO3 composite hydrogel for smart window applications	Elsevier	8	1
2	B Hui, Y Zhang, L Ye	Preparation of PVA hydrogel beads andadsorption mechanism for advanced phosphate removal	Elsevier	148	2
3	Q Wang, X Pan, J Guo, L Huang, L Chen, X Ma	A thermally reduced graphene oxide membrane interlayered with an in situsynthesized nanospacer for water desalination	pubs.rsc.org	39	3
4	L Feng, Q Zhang, F	Phosphate removal performances of	Elsevier	24	4

e-ISSN : 2622-4968, p-ISSN : 2622-1349

	Ji, L Jiang, C Liu, Q Shen	layereddouble hydroxides (LDH) embedded polyvinyl alcohol/lanthanum alginate hydrogels			
5	GR Mahdavinia, A Massoudi, A Baghban	Study of adsorption of cationic dye on magnetic kappa carrageenan/PVA nanocomposite hydrogels	pubs.rsc.org	120	5
6	A Santos, FWF de Oliveira, FHA Silva, DA Maria	Synthesis and characterization of iron-PVA hydrogel microspheres and their use in thearsenic (V) removal from aqueous solution	Elsevier	30	6
7	X Wang, X Wang, M Pi, R Ran	High-strength, highly conductive and woven organic hydrogel fibers for flexible electronics	pubs.rsc.org	17	7
8	X Pan, Q Wang, R Guo, Y Ni, K Liu, X Ouyang…	An integrated transparent, UV-filtering organohydrogel sensor via molecular-level ion conductive channels	pubs.rsc.org	105	8
9	Q Guan, G Lin, Y Gong, J Wang, W Tan	Highly efficient self-healable and dual responsive hydrogel-based deformable triboelectric nanogenerators for wearable Electronics	pubs.rsc.org	116	9
10	X Luo, MY Akram, Y Yuan, J Nie	Silicon dioxide/poly (vinyl alcohol) composite hydrogels with high mechanical properties and low swellability	pubs.rsc.org	28	10

e-ISSN : 2622-4968, p-ISSN : 2622-1349

in the title and abstract. Therefore, there is a predetermined size of letters and circles. The more often these keywordsappear, the larger the size of the letters and circles.

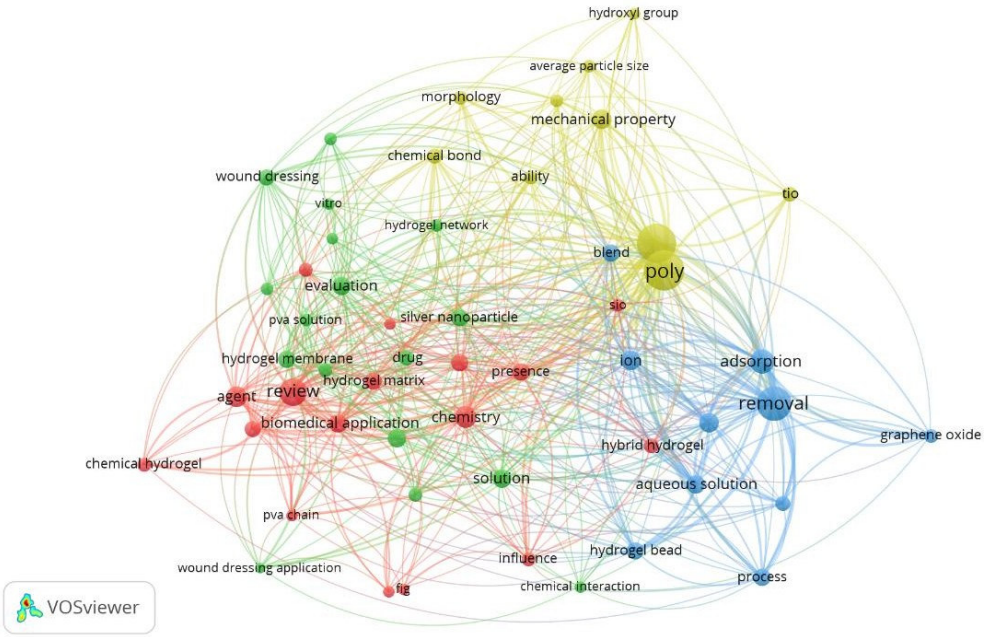


Figure 3. Visualization topic areas using VOSviewers using Network Visualization

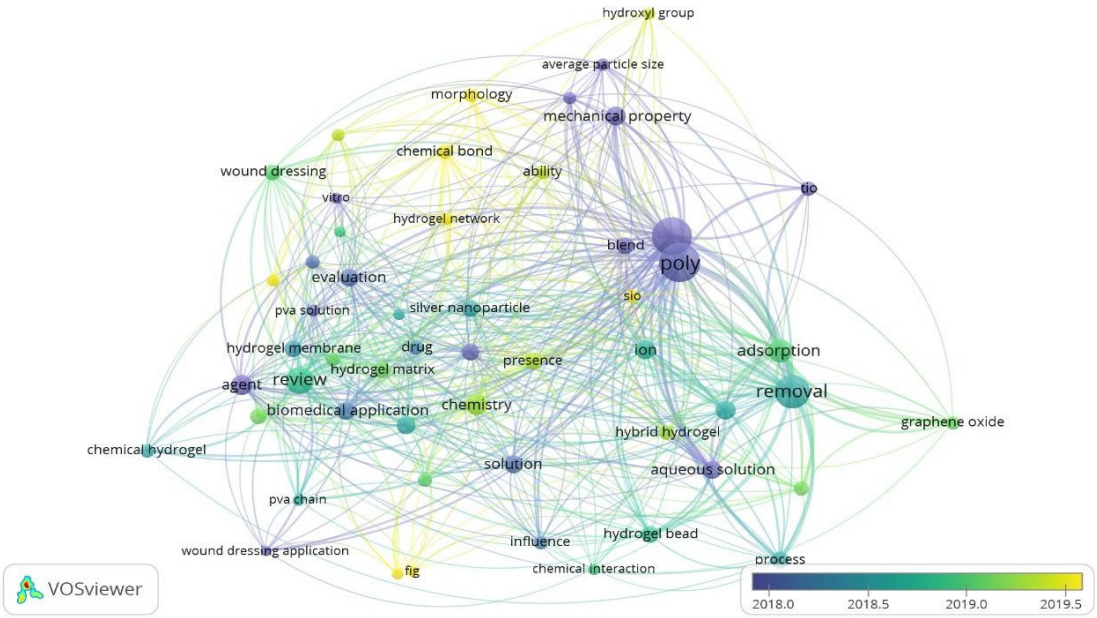


Figure 4. Visualization topic area using VOSviewers using Overlay Visualization

e-ISSN : 2622-4968, p-ISSN : 2622-1349

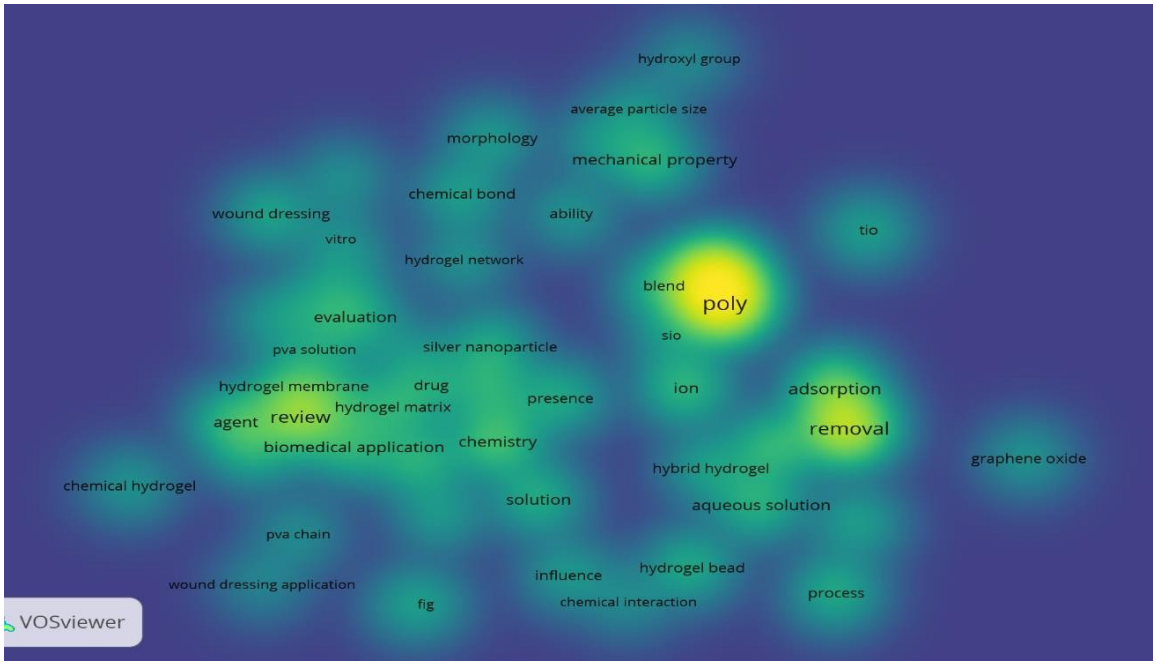


Figure 5. Visualization topic area using VOSviewers using Density Visualization

a. Network Visualization Analysis

The result of extraction from the criteria namely title, abstract, and keywords found is the relationship of one wordwith another. Where the poly items (Figure 6) and Vinyl Alcohol (Figure 7) in cluster 4 are the centers of the research. Because this Poly item is contained in many articles. This Poly item is found in 45 links, 262 total link strength, and 133occurrences. Likewise, this Vinyl Alcohol item is found in 43 links, 244 total link strength, and 122 occurrences.

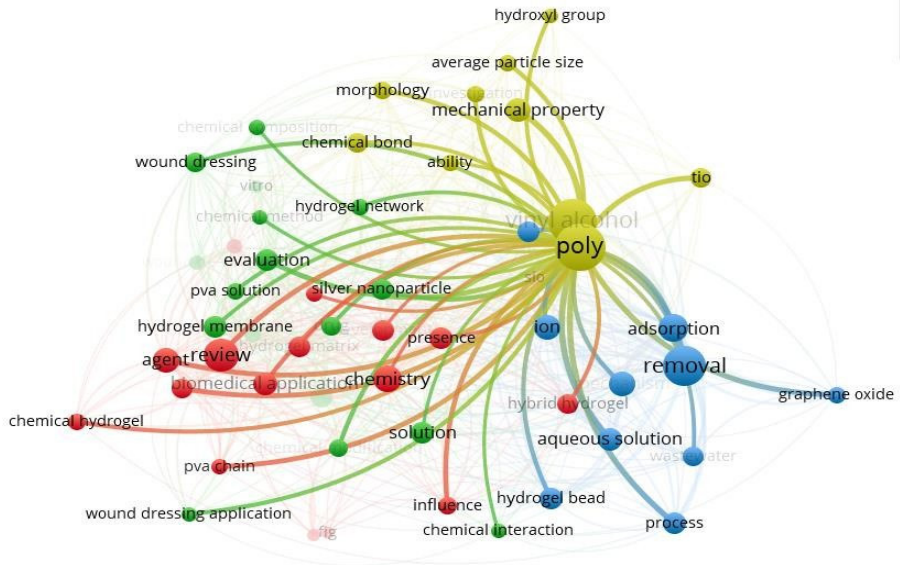


Figure 6. Network Visualization of Poly Item

e-ISSN : 2622-4968, p-ISSN : 2622-1349

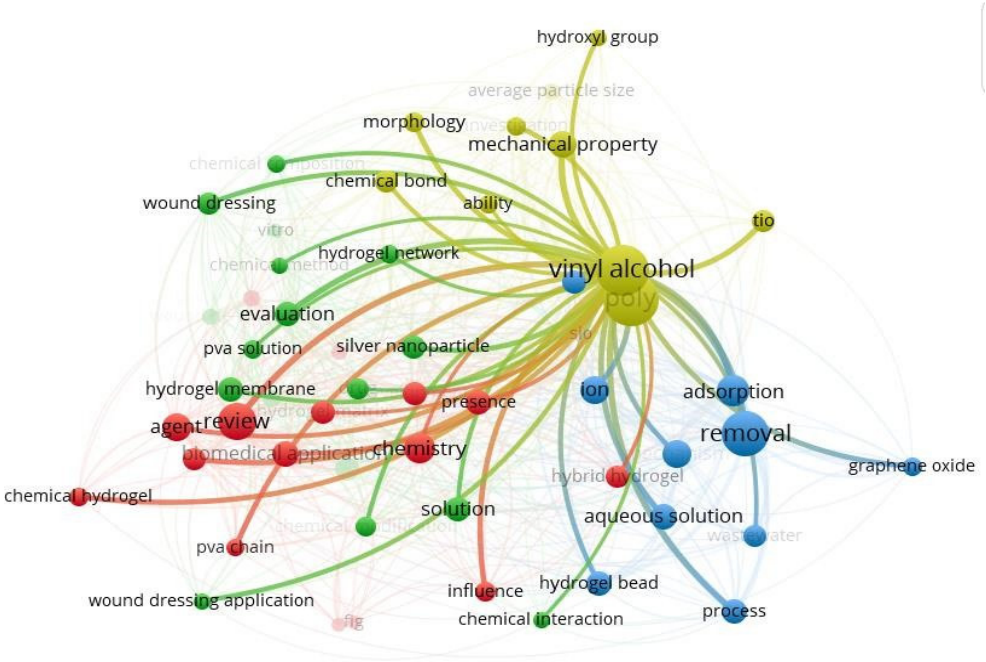


Figure 7. Network Visualization of Vinyl Alcohol Item

In the analysis of silver nanoparticle items (Figure 8) several items are interconnected. One of them is adsorption. While in the Poly item (Figure 6) there are also several related items, for example, namely adsorption and removal. Likewise with the hydrogel membrane (Figure 9), several related items, for example, namely adsorption and removal. In these three items, there are the same and interrelated items, namely the adsorption item. But the Silver Nanoparticle itemhas no direct relationship with the removal item. It can be possible to conduct new research related to Silver Nanoparticleitems and Removal items.

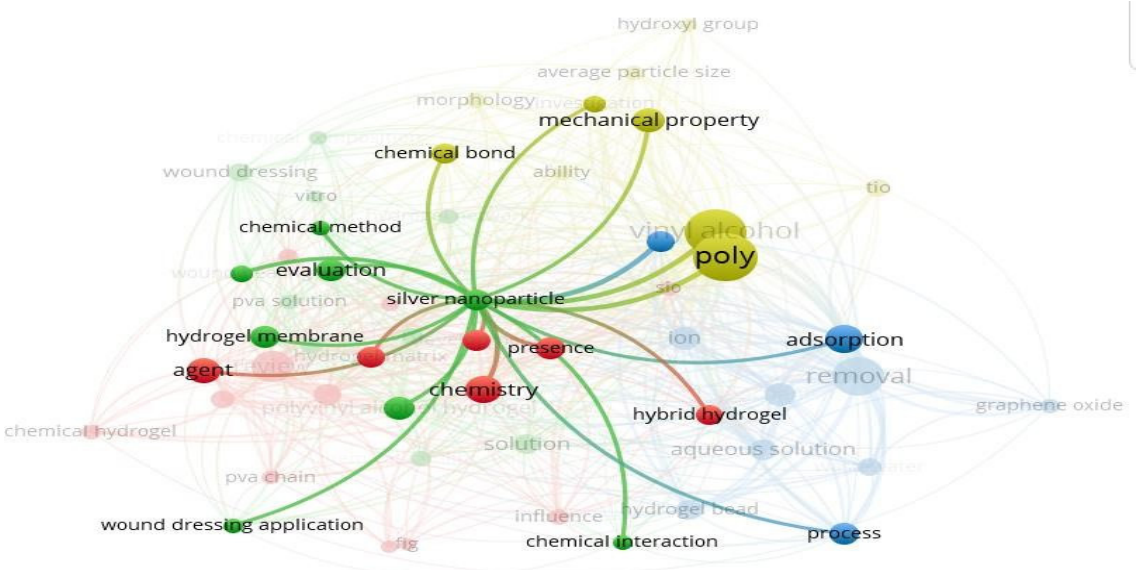


Figure 8. Network Visualization of Silver Nanoparticle Item

e-ISSN : 2622-4968, p-ISSN : 2622-1349

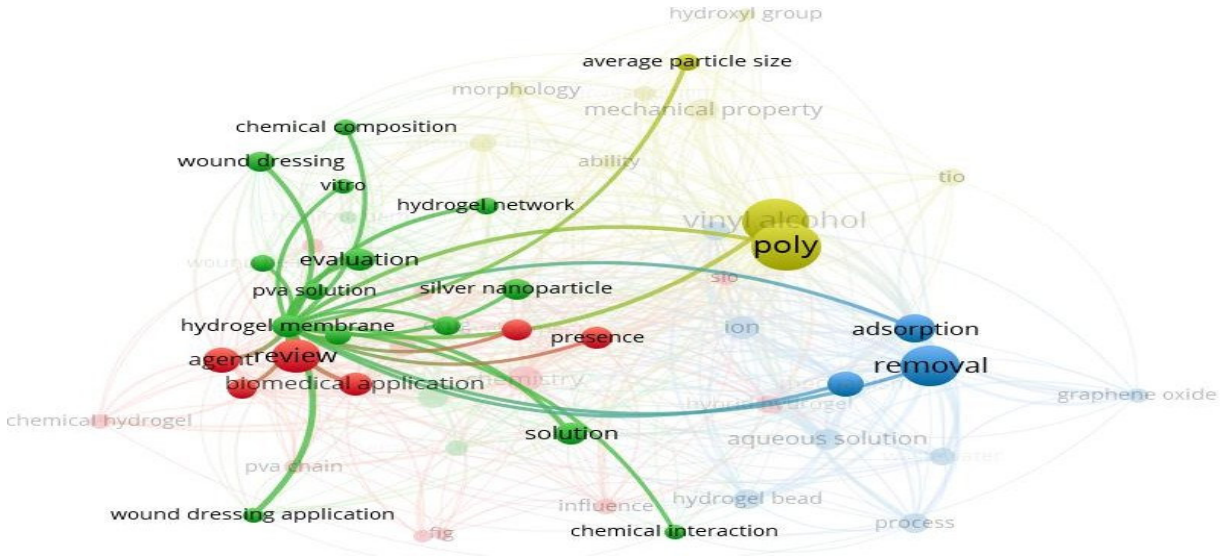


Figure 9. Network Visualization of Hydrogel Membrane Item

b. Overlay Visualization Analysis

The item data on the overlay visualization menu shows the period of publication. In the Poly item data (Figure 10) most research was carried out in 2018. Then continued with several other studies with hydroxyl group items in 2019 which also related to Poly items (Figure 11).

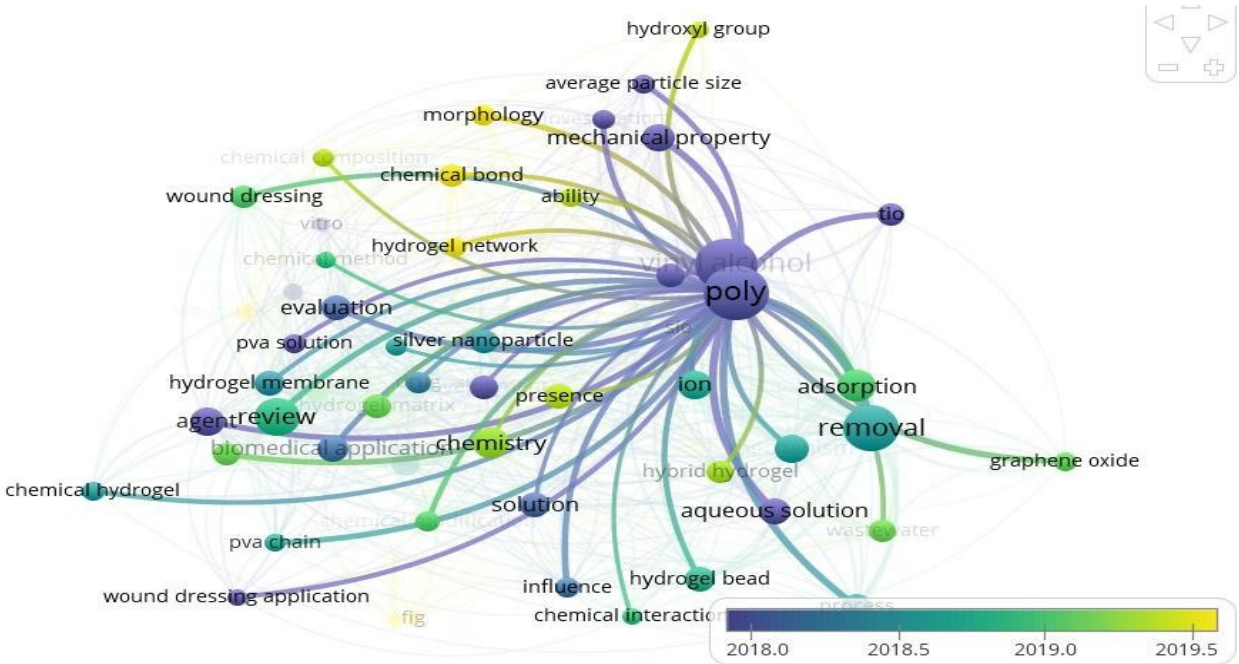


Figure 10. Overlay Visualization of Poly Item

e-ISSN : 2622-4968, p-ISSN : 2622-1349

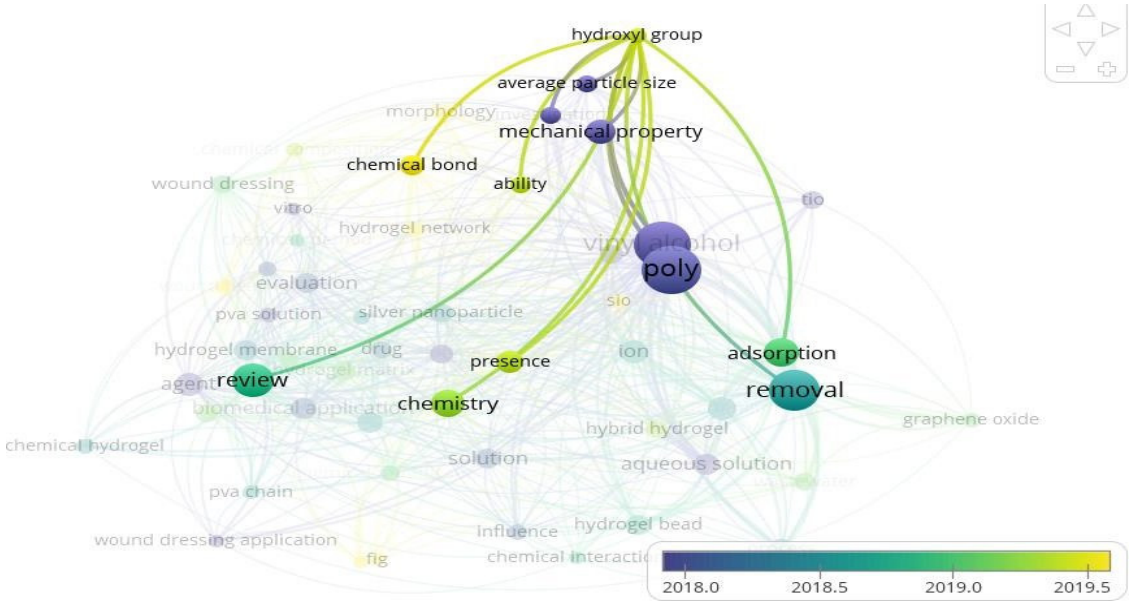


Figure 11. Overlay Visualization of Hydroxyl group Item

c. Density Visualization Analysis

This density visualization shows how deep the researcher is in conducting research using existing items. The deeperthe item, the wider the scope or if you look at the VOSviewers the lighter the color will be. It can be seen in (Figure 12),it is explained that poly items and Vinyl Alcohol items have already been researched in many studies.

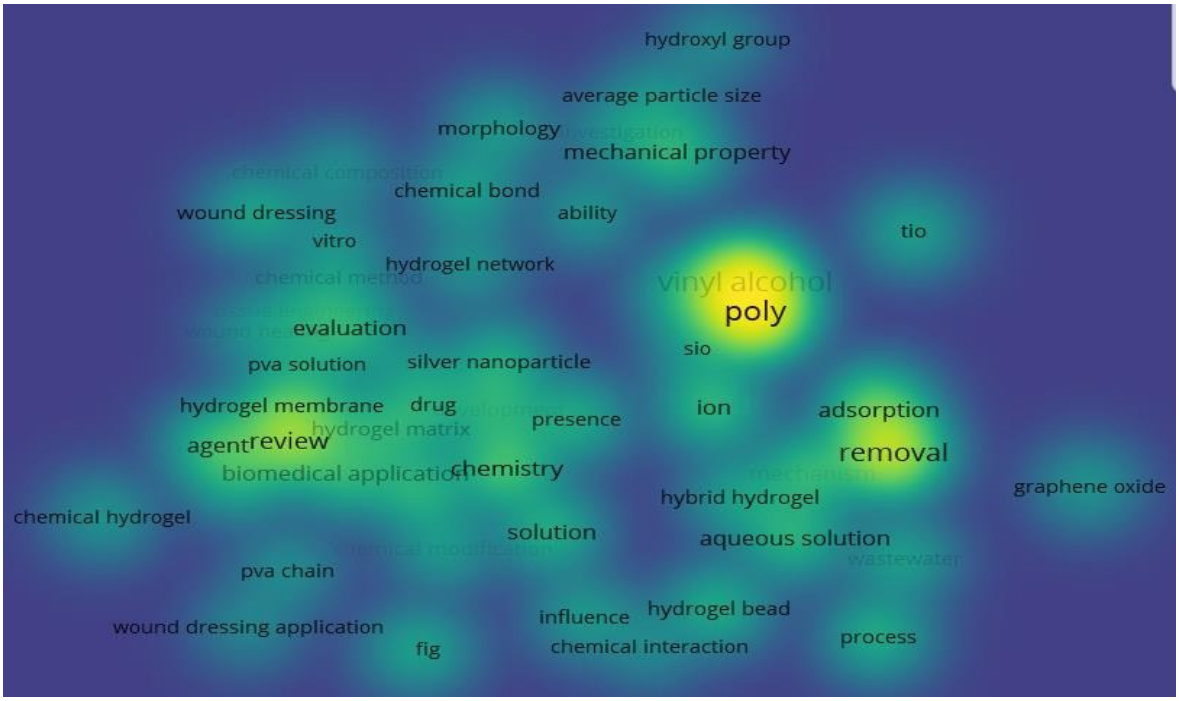


Figure 12. Density Visualization of Poly and Vinyl Alcohol Items

e-ISSN : 2622-4968, p-ISSN : 2622-1349

4. CONCLUSION

The research conducted is to analyze bibliometrics about PVA and Hydrogel particles. In the process of planning research on PVA and Hydrogel particles, it can be used with bibliometric analysis using VOSviewers to ensure that the research to be carried out has never been studied and knows the relationship of each related item. The three processes underlying the search use the keywords "chemistry, particle, PVA, and Hydrogel" namely title, abstract, and keyword. The search results found 98 articles that were relevant and met the criteria. Based on the results of VOSviewers mapping, it was found that most PVA and Hydrogel Particle studies found that particle studies with Poly and Vinyl Alcohol itemswere most studied in the 2012-2022 range. Some items are not related to the PVA Hydrogel Membrane but these items are interconnected with other items so it can be concluded that there are still many items that can be used for further research.

REFERENCES

1. Putri L M., Trapsilo Prihandono, & Bambang Supriadi. (**2017**). Pengaruh Konsentrasi Larutan Terhadap Laju Kenaikan Suhu Larutan. *Jurnal Pembelajaran Fisika*. 6(2). 146-153.
2. Firmansyah, Muhammad Syakhir, & Liferdi. (**2017**). The Influence of Dose Combination Fertilizer N, P, and Kon Growth and Yield of Eggplant Crops (Solanum melongena L.). *J. Hort*. 27(1). 69-78.
3. Hendrawan., Fitri K, Yaya S & Nuruh C. (**2016**). Physical dan Chemical Characteristics of Alginate-Poly (Vinyl Alcohol) Based Controlled Release Hydrogel. *Journal of Enviromental Chemical Engineering*. 4(1). 4863-4869.
4. Lai, Jieyu., Dengjie Yu, Changkai Ni, Aohan, Wenfeng, & Yusheng. (**2022**). A Worldwide Bibliometric and Visualized Analysis in Publications of Research About Hydrogel in Cartilage *Repair, Frontiers in Materials*. 9(1). 1-11.
5. Prasetyo, Hendi. (**2021**). Bibliometric Analysis on Scholarly Journals Proquest with Keywords “Tourism In Indonesia” Using Vosviewer Software. *Jurnal Pariwisata dan Budaya*. 12(1). 16-21.
6. Rafika., Hanafiah, & Fitroh. (**2017**). Analisis Mesin Pencarian Google Scholar Sebagai Sumber Baru Untuk Kutipan. *STMIK Raharja Tangerang*. 3(2). 193-205.
7. Herawati, P., Sawitri, & Nina Karlina. (**2022**). Analisis Bibliometrik: Perkembangan penelitian dan Publikasi Mengenai Koordinasi Program Menggunakan VOSviewers. *Jurnal Pustaka Budaya*. 9(1). 1-8.
8. Hamidah I., Saryono, dan Muhammad Nur Hudha. (**2020**). A Bibliometric Analysis of Covid-19 Research using VOSviewer. *Indonesian journal of science and technology*. 5(2). 2019-216.
9. Liu H., & Baoki Zuo. (**2020**). Sound Absorption Properties of Spiral Vane Electrospun PVA/Nano Particle Nanofiber Membrane and Non-Woven Composite Material. *Journal of Industrial Textile*. 50 (4). 512-525.
10. Rahmawati, N. A. R. S. (**2011**). *Oksidasi Lanjut dan Filtrasi Membran Keramik Untuk Penyisihan Besi, Mangan, Amonia, dan Linear Alkylbenzene Sulfonate dari Air Tanah*. Program Studi Kesehatan Kerja dan Lingkungan, Universitas Indonesia.
11. Wang C., Shen, Z., Hu, P., Wang, T., Zhang X., Liang, L., & Zhang, K. (**2021**). Facile Fabrication and Characterization of High-Performance Borax-PVA Hydrogel. *Journal of Sol-Gel Science and Technology*, 1-11.

e-ISSN : 2622-4968, p-ISSN : 2622-1349