Mica and Glass Fiber-Filled PVC Composites

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Abstract The in-depth analysis of the keywords used in a given scientific area provides an overview of the area and helps understand it better. Accordingly, in the present work, the analysis of the authors' keywords was the basis and the opening point for discussing the available literature on mica-filled PVC composites and glass fiber-filled PVC composites. Searches in Scopus database were performed to obtain the data inputs and the results were analyzed by Bibliometrix. The Literature concerning the subject was discussed, resulting in an overview of the literature regarding mica-filled PVC composites and glass fiber-filled PVC composites.

Keywords Polyvinyl chloride (PVC) · Mica · Glass fiber · Composites · Authors' keywords

1 Introduction

Polyvinyl chloride (PVC), a thermoplastic polymer, is notable for its extraordinary assortment and extend of properties determined through arranged definitions of each composition for specific purposes. It is always associated with additives, which define its properties and applications [74].

In Europe, PVC accounts for approximately 10% of the estimated European demand for thermoplastic polymers. It is widely applied as a raw material for building materials such as liners, floor coverings, pipes and fittings, cable insulation, doors and window frames, tiles, roofing sheets, profiles, among others [66], being considered an irreplaceable material in these applications [47]. It also has a large use in other sectors of the economy, with applications such as bottles, packaging, medical products, etc. To make electric cables and wires, PVC is the second common polymer used [20] due to its low price and excellent electrical insulating properties [97], being the first the polyethylene.

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Even presenting properties of great interest, these are often insufficient for some specific applications, and it is necessary to add another material to develop a composite with superior properties. In addition, it is more economically viable to join two materials than to develop another molecule in the laboratory.

Composite reinforced with fibers is one of the most used materials. It can be divided into three groups based on the matrix material—polymer, metal, or ceramic. Polymeric composites can be made of thermoplastic or thermoset matrices. It takes advantage of the stiffness and strength of high-performance fibers dispersed in the matrix, acting as a binder and transferring forces to the fibers across the fiber-matrix interface [41].

Fiber-reinforced composites present high strength to weight ratio and anisotropic properties. The high strength of these composites has empowered them to compete with other materials, counting metals. Their anisotropic properties permit the designer to accomplish the wanted properties in the specific locations keeping the same weight [7]. A very high number of researchers have strived to develop advanced composites that have applications in important branches such as aeronautics, marine, and automotive.

Reinforcing fibers may be used in different forms, such as short, long, and continuous [7]. The main task of reinforcing fibers is to make the composite resistant to pressure by transferring force from one fiber to another [43].

Regarding glass fiber and mica, literature depicts the reinforcing character of mica and glass fiber on polymeric matrices [87]. Glass fibers are the foremost broadly used as a reinforcement within the composites industry, and many kinds of them are commercially accessible. Their chemical compounds are distinctive, and each one is appropriate for a specific application. Glass fibers present good strength and hardness. However, their elastic modulus is rather low [7]. Mica is a natural mineral abundant in nature. It has a high aspect ratio and strength, high crystallinity, thermal stability, corrosion resistance, and physical stability [30]. Mica has excellent chemical resistance, good electrical properties, low thermal expansion, and it causes less wear and abrasion to the processing equipment. Its arc resistance and surface resistance improve the mechanical properties of PVC [20]. It also shows significant upgrading in dielectric properties of composites [20].

Bibliometric analysis is a powerful tool in the deep investigation of any research area. It is based on a quantitative analysis of the literature of a given research area [65]. This kind of analysis arose to cope with constantly growing bodies of knowledge and incorporates three main following dimensions (measuring a specific scientific activity, its impacts taken by the total number of article citations, and the associations among articles) [61]. Many different research areas take advantage of the benefits of this tool. Examples of recent publications include different areas such as microfinance [65], medicine [86, 90, 96], infrastructure projects [13], sustainable agrifood supply chains [1], among many others.

By searching in a database such as Scopus or Web of Science, from the obtained result is generated a .bib file, which is analyzed through Bibliometrix, a R-package, being the results revealed through Biblioshiny. All the data can be analyzed such as the keywords, authors, publications, publication countries, affiliations, among others.

According to Zhou et al. [102], “keywords are the core of the paper, which indicates the research direction of the field by abstracting and summarizing the research content of the academic paper”. Through the analysis of the keywords, it is possible to obtain a panorama of the research field, the hotspots, and the future trends [17, 18, 19].

In the present work, due to the relevance of the analysis of the authors’ keywords, this was the initial point and the basis to obtain an overview of the literature about mica-filled PVC composites and glass fiber-filled PVC composites. Searches in Scopus database were performed to obtain the data inputs, being the results analyzed by Bibliometrix. Literature concerning the subject was briefly discussed.

2 Methodology

Two Scopus searches were performed to obtain the data. The first one was performed on April 19th 2022 by using the words “composite*” AND “PVC” AND “mica”. The second one was performed on May 3rd 2022 by using the words “composite*” AND “PVC” AND “glass fiber*”.

In both cases, the obtained results were analyzed by Bibliometrix (from the .bib file generated by Scopus in each search), an R-package. Emphasis in the investigation of the authors’ keywords was given.

3 Results and Discussion

3.1 Glass Fiber-Filled PVC Composites

The Scopus search by using the words “composite*” AND “PVC” AND “glass fiber*” resulted in 192 documents in English, being 189 articles and 3 reviews. The publications are from 1980 up to the search date.

Figure 1 shows the word cloud containing the 50 most popular authors’ keywords, in which the size of the letters represents the number of occurrences in the result of the Scopus search.

Based on the word cloud, an overview of the subject of glass fiber-filled PVC composites can be outlined. According to Shi et al. [70], the word cloud is a clear and entire graphical display of hot topics analyzed in a research area.

Apart from the keywords used in the Scopus search, others more popular in the literature are (number of occurrences in parenthesis) PVC foam (12), sandwich composite (9), sandwich composites (9), mechanical properties (7), composite sandwich panels (6), filled polymer (5), mechanical property (5), mechanical testing (5), modulus (5), damage (4), finite element analysis (4), and frequency (4). These keywords demonstrate both the trends of the research area, as well as some concerns and priorities. The keywords ‘sandwich composite’ and ‘sandwich composites’ can

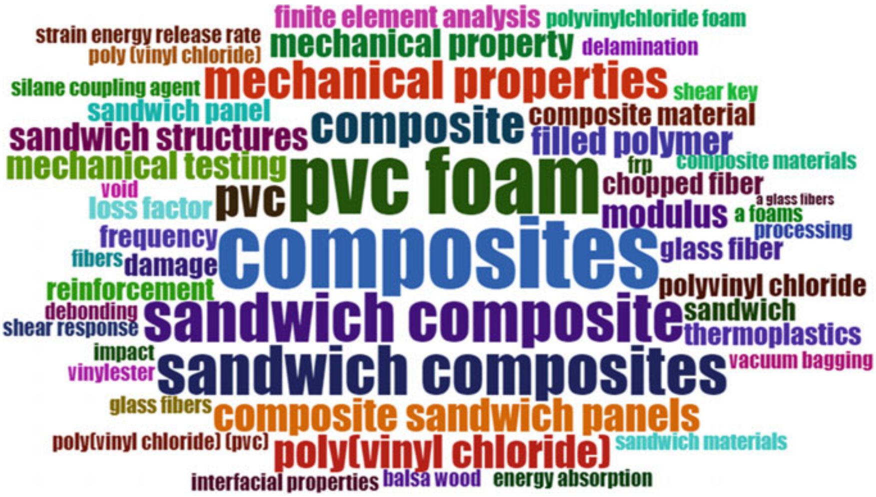

Fig. 1 Word cloud containing the 50 most popular authors' keywords

be merged as 'sandwich composite*', as well as the keywords 'mechanical properties' and 'mechanical property' can be merged as 'mechanical propert*'. So, these keywords have a huge importance in the glass fiber-filled PVC composites research field, being that 'sandwich composite*' obtained 18 occurrences and 'mechanical propert*' 12 occurrences. With this, the authors' keywords 'PVC foam', 'sandwich composite*', and 'mechanical propert*' can be considered hot topics in the research field, as well as top keywords.

Word cloud (Fig. 1) revealed the core of the glass fiber-filled PVC composites literature showing some materials such as silane coupling agent [46], chopped filler [14, 46, 64, 84], thermoplastics [25, 55, 79, 91]; some properties and concerns such as mechanical properties (and mechanical property) [14, 23, 24, 41, 46, 47, 50, 59, 64, 69, 75, 77, 80, 82, 84, 93], energy absorption [2, 39, 40, 52, 72, 98, 100, 101], interfacial properties [14, 54, 59, 73, 84], impact [2, 6, 14, 15, 47, 60, 76, 77, 84, 98, 100, 101], shear response [44, 57], debonding [6, 31–33, 45], damage [5, 6, 9, 11, 12, 38, 53, 59, 60, 67, 71, 73, 75–77], loss factor [9, 31–33], void [41, 64, 81], delamination [44, 45, 68, 85], strain energy release rate [8, 51, 77], modulus [25, 35, 93]; ways used to characterize and model properties such as finite element analysis [8, 32, 57, 88, 101] and mechanical testing [10, 39, 40, 75, 77, 80, 84]; and vaccum bagging, a processing method [22, 23, 24, 29, 54, 76] among many others.

According to Zhao et al. [98], a sandwich structure consists of two stiff face sheets with high-strength combined with a core part made of light-weight materials. Specific properties such as energy absorption, specific stiffness, and strength [39, 72] are responsible for its wide use in various industrial branches, as well as to be cost-effective [72]. Many weight-critical industrial fields take advantage of the lightweight and high flexural stiffness of sandwich structures [80]. Concerning glass fiber-filled PVC composites, it can be observed that literature is focused on sandwich structures. In general, PVC is used in the sandwich core as PVC foam and glass fibers as reinforcing agents.

An overview from literature will be presented in the sequence, in which some publications will be briefly presented.

Concerning PVC foam, it is widely used in naval ships [26, 59, 60, 73], aircrafts [98], and automobiles [98] due to its low density. In particular, sandwich composite structures with the core material being a polymer foam or balsa wood are extensively used in the construction of naval ships [26, 60, 77, 88]. By analyzing these materials, the authors adopt both experimental [24, 26, 32, 45, 52, 76, 98] and numerical investigations [24, 26, 45, 85, 88], such as finite element model [8, 32, 56, 57, 88, 101].

For marine applications is essential to analyze the aging behavior in an environment as real as possible [22, 23, 24]. Concerning experimental investigations, mechanical properties are largely observed [14, 41, 75] (as previously observed in Fig. 1), but some authors examine other properties such as the vibration behavior [9, 31], the energy absorption [2, 95, 101], among others. Literature also seems to be interested in the use of fiber glass as reinforcement in wood/PVC composites [55, 79, 91]. Other applications of sandwich structures are in wave absorbing structures such as radars [3].

As processing methods used, it seems that the vacuum-assisted resin infusion process [8, 15, 24] is the most adopted by literature.

Very relevant in the area is the study of the aging of sandwich composites. Ding et al. [22] examined the behavior of moisture absorption and evolution of various mechanical properties for the sandwich composites immersed in seawater at 30 °C and pure water at 80 °C. Later, the research group [24] studied the same parameters in different harsh environments such as salt-fog spray aging, hygrothermal atmosphere alternating high and low temperature, and solar radiation in combination with water vapor. Toubia et al. [75] analyzed the evolution of various mechanical properties of sandwich panels using foam core with fiber glass/vinyl ester face sheets by exposing them to 100 days of freeze/thaw exposure (−20 to 20 ºC) in the presence of a saline solution.

Ding et al. [24] examined the behavior of moisture absorption and the evolution of various mechanical properties of sandwich composites with ECR glass fiber/vinylester composites faces bonded to PVC foam core. The samples were exposed to different harsh environments such as salt-fog spray aging, hygrothermal atmosphere alternating high and low temperature and solar radiation in combination with water vapor. The results found that the samples exposed to the solar radiation in combination with water vapor deteriorated appreciably in the faces-core interfacial properties.

Other authors [84] examined the reinforcing influence of fibers given by the interfacial bonding between PVC foam core and glass fiber face sheets. The authors found notable improvements in bending strength, energy absorption, and impact strength due to the applied treatment of the fibers: to form a connection between the face and core, one side of the fiber was coated with epoxy extending from the foam, and the other side was embedded into the lower part of the foam layer. Chen et al. [14] used glass fiber to improve the interfacial bonding between PVC core and glass fiber face sheets and observed that the bending strength and energy absorption were enhanced by up to 100% and around 161%, respectively, under three-point bending.

Lee et al. [46] analyzed the reinforcement of chopped glass fiber in PVC containing silane coupling through the mechanical properties. The aspect ratio of the fibers influenced the mechanical properties in different ways, and the presence of silane coupling improved the mechanical properties of the composites, since the compatibility between the phases was enhanced. Mechanical properties were also enhanced in the work by Shanmugasundar et al. [69] due to the presence of graphene in PVC/graphene/glass fiber composites. So, all these publications demonstrate the importance of adequate interaction between the phases in obtaining higher properties.

It is known that sandwich structures are increasingly used in marine applications, wind turbine blades, and spacecraft, and there is a great difficulty in recycling them, being that sometimes their recycling is not possible and feasible. Thus, the study of repairs in these structures is essential. Some authors [4] applied different types of repairs such as the conventional patch repair, extra fiber reinforced repair, splitted fill foam repair, and internal reinforced repair. They observed that extra fiber reinforced repair showed a better performance compared to the conventional patch repair. According to the authors, by reinforcing the discontinuous zones formed in the repair zone, the extra fiber reinforced repair method provides a more robust structure than the conventional patch repair.

In line with the previous work, some authors [47] produced PVC composites reinforced by glass fiber with carbon deposit (GFCD), derived from the recycling of wind turbine blades. It was observed a fine adhesion between the filer and PVC matrix, which resulted in enhanced mechanical properties when using a small concentration of the filler. Additionally, according to the authors, "the percentage of GFCD affects neither the temperature of thermal stability nor the time of thermal stability which is extremely important in the case of PVC composites". Such results are extremely important since they deal with the use of a material derived from the recycling of wind turbine blades, relevant items in the generation of energy from renewable sources.

Zal et al. [93] evaluated the effects of some processing parameters such as pressure, time, and temperature on the properties of amorphous PVC/fiber glass composite. An elevated processing time and temperature resulted in the degradation of PVC. On the other hand, an increase in the temperature up to 230 °C enhanced the flexural strength. Regarding the processing time, it proved to be relevant at low temperatures since enhanced the wetting, impregnation quality, and mechanical properties. Processing pressures showed a slight improvement in the mechanical properties at low temperatures.

Park et al. [64] produced PVC/fiber glass composites and examined the effect of length and concentration of chopped glass fiber on the composites. It was observed an increase in flexural strength and tensile strength due to the increase of the fiber length, whereas interlaminar shear strength was enhanced due to the increase of the fiber concentration. The authors concluded that the content and length of the chopped fibers act differently on each mechanical property analyzed.

Importantly, some authors [59, 73] examined the influence of interfacial crack size and impact damage size on sandwich composite composed of glass reinforced polymer skins and PVC foam core. All the examined properties were negatively impacted by crack size and impact damage size, bringing implications on the structural integrity of a minehunting ship made of the composite. Other authors also analyzed different types of damages to sandwich structures [5, 6, 9, 11, 12, 26, 38, 44, 53, 60, 56, 59, 60, 67, 71, 73, 75–77].

Gargano et al. [26] examined the explosive blast response of sandwich composite panels with a PVC foam core with polymer laminate facesheets reinforced with carbon or glass fibers. The results showed that the explosive blast resistance of sandwich composite structures was impacted by both the sort of fiber reinforcement used in the laminate facesheets and the kind of core material. Glass fiber showed superior results both for the resistance to out-of-plane deformation and resistance to damage.

In another purpose, Zhou et al. [101] produced tube reinforced PVC foam cores and investigated their energy-absorbing characteristics by using both experimental and numerical investigation (finite element method). The results proved that embedding the tubes in a foam panel enhanced their ability to absorb energy. Additionally, the energy-absorbing capability of tube-based foams was higher than many comparable core systems, highlighting their potential for use in conditions of extreme crushing. The validated models agreed with the experimental data.

Trend topics on the investigated data were also analyzed and are presented in Fig. 2. The top authors' keywords of the last 20 years were chosen to be studied. The minimum frequency of the keywords was 5, and the number of keywords per year 2.

In Fig. 2, the strongest authors' keywords are depicted, i.e., the authors' keywords with the highest number of occurrences in the last 20 years, also known as top authors' keywords. The most popular authors' keywords, apart from the ones used

Fig. 2 Trend topics concerning glass fiber-filled PVC composites research field

in the Scopus search are: mechanical testing (2007–2014), mechanical properties (2009–2016), composites (2008–2013), composite sandwich panels (2008–2013), PVC foam (2006–2015), composite (2008–2014), sandwich composite (2015–2018), sandwich structures (2010–2019), and sandwich composites (2007–2019). The strongest authors' keywords in the last years can be considered trends in the research field, i.e., sandwich composites. Considering the merging explained before, in which 'sandwich composites' and 'sandwich composite' become 'sandwich composite*', the strength of this keyword becomes even bigger, which makes it an utmost trend.

Furthermore, according to de Sousa [19], through this kind of analysis, the evolution of the top authors' keywords can be observed over the years. It can be observed that some keywords remain in evidence over a period of time, giving rise to other keywords due to the natural evolution of the literature. So, it can be observed that some keywords such as 'mechanical testing' and 'composite sandwich panels' are no longer in evidence in the literature about glass fiber-filled PVC composites today.

The size of the blue circles means the term frequency. For instance, 'sandwich composites' was the strongest term in 2018, receiving 9 occurrences.

Figure 3 shows the authors' keywords dynamic in the last 20 years. Only the top authors' keywords were analyzed, i.e., 'PVC foam', 'sandwich composite*', and 'mechanical propert*'.

Based on Fig. 3, it can be observed that the three keywords seem to develop with a similar growth rate until 2017. Until 2013, 'mechanical propert*' presented a higher number of occurrences than 'PVC foam' and 'sandwich composite*'. In

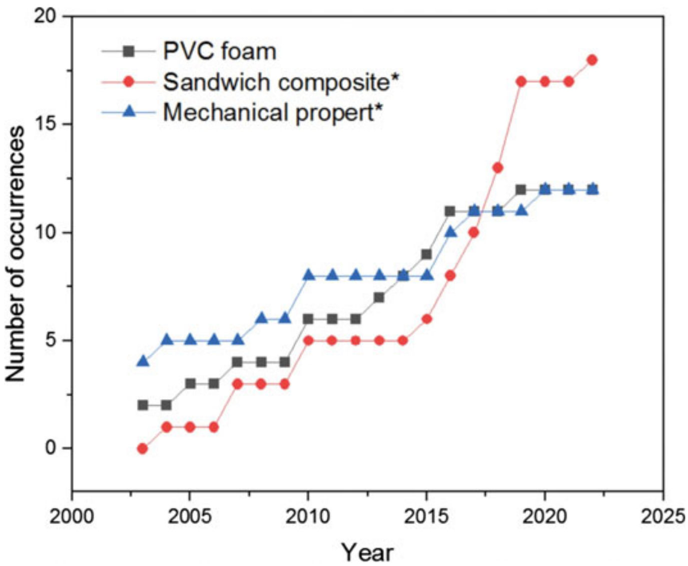

Fig. 3 Dynamic of the authors' keywords 'PVC foam', 'sandwich composite*', and 'mechanical propert*' in the last 20 years

2018, 'sandwich composite*' tacked off, presenting since then a higher number of occurrences per year and a higher growth rate than the others.

This result corroborates with the trend topics presented in Fig. 2. 'Sandwich composite*' is the strongest authors' keyword at present by attracting a higher interest of researchers. All the keywords analyzed in Fig. 1 are trend topics in the glass fiber-filled PVC composites research field, but 'sandwich composite*' is the most popular authors' keyword nowadays.

3.2 Mica-Filled PVC Composites

The search in the Scopus database with the words "composite*" AND "PVC" AND "mica" resulted in 21 documents in English, being 20 articles and 1 review, from 1981 to the search date.

Figure 4 brings the word cloud containing the 24 most popular authors' keywords, in which the size of the letters represents the number of occurrences in the result of the Scopus search.

Apart from the keywords used in the Scopus search, the one with the highest number of occurrences is 'interface', with 2 occurrences. The other authors' keywords present the same number of occurrences. The small number of occurrences is due to the reduced number of documents found in the Scopus search.

The word cloud (Fig. 4) depicts that the literature concerning mica-filled PVC composites is focused on the materials and their characteristics such as PVC foam [34, 41, 89], phlogopide mica [34], filler shape [41], filler aspect ratio [41], rigid PVC foam [34, 41], filler geometry [41], fly ash (and flyash) [41]; properties and behavior of the materials such as thermal properties [41], stiffness [83], thermal degradation behavior, rheology [94], sound transmission loss [83], partial specific compressibility [49], among others; processing ways and characterization techniques such as injection molding and scanning electron microscopy [21]. All these keywords

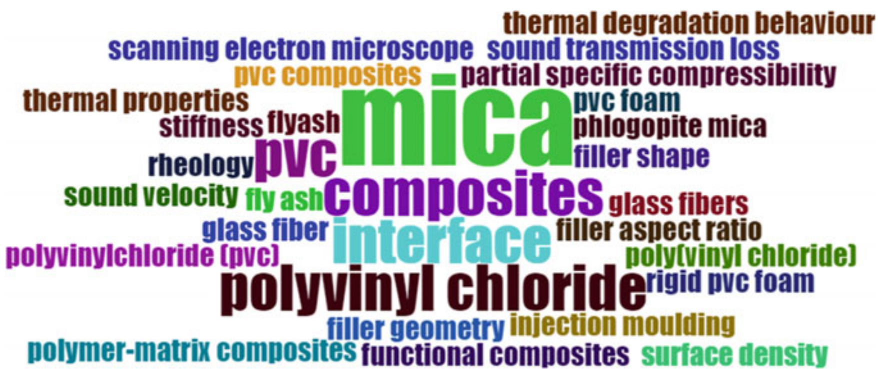

Fig. 4 Word cloud containing the 24 most popular authors' keywords

outline a panorama [17, 18, 19], concerns of the authors, and the central aspects about mica-filled PVC composites.

According to the results presented in Fig. 4, 'interface' is an important author's keyword in the research field of mica-filled PVC composites [42]. It is known that the mechanical properties of a polymeric composite as a whole depend on the adhesion between the phases, i.e., matrix phase and dispersed phase. In other words, the performance of a given composite is robustly influenced by the matrix-fiber interfacial bonding [28, 37, 63, 92], and the mechanical properties as a consequence. Researchers often use a coupling agent [36], a compatibilizing agent [28], another polymer [62], or even another filler (such as a nanometric filler [69, 99]) in the search of a superior adhesion between the phases. According to Kim and Mai [42], the interfacial strength influences the mechanical and interlaminar fracture properties of composites. Poor wetting of fibers, resulted by the poor fiber/matrix bonding, causes fibers pulled out during the tensile test [92]. Consequently, a concern of the literature on the subject is to study the fracture behavior of these structures [51, 72].

From this point on, literature about mica-filled PVC composites will be briefly presented.

Deshmukh and Rao [20] analyzed the use of mica in different concentrations as filler in PVC matrix. The results demonstrated that, in general, composites presented a slight improvement in the mechanical and electrical properties. The surface treatment of mica improved de arc resistance of composites. Similar behavior was found by Khoshnoud and Abu-Zahra [41], that analyzed the properties of PVC foam composites reinforced with different shape fillers. The tensile strength of the composite containing 10 wt% of mica was slightly improved.

In a previous work, the authors [21] analyzed the influence of particle size, filler concentration, and surface treatment of mica on the mechanical and electrical properties of mica-filled PVC composites. The increase in filler concentration improved the dielectric strength, surface resistance, and Young's modulus. Surface treatment increased the arc resistance of the composites.

Concerning environmental issues and personal unhealthiness, noise pollution has turned out to be one of the major concerns [89]. Given the importance of the subject, the literature seems to be focused on minimizing the problem by using polymeric soundproofing materials as noise control applications. Mica is also used in PVC matrix to improve the sound insulation property of PVC [83], being the PVC/mica composites considered sound absorbers and insulating materials, which are very useful in the reduction of ambient noise [83].

Tripathi et al. [78] studied the effect of grain size on the dielectric properties of PVC/mica composites films. The authors found improved insulating properties of the composites. According to the authors, the reduced grain size of mica increased the intermolecular interaction, while the increase in the grain size increased the plasticizer effect. Correspondingly, some authors [89] sought the increase in sound insulation of the composites lightweight flexible PVC foam-mica. They found that, with a content of mica below 10 wt%, the composites presented good sound insulation properties and maintained ultra-light weight. Wang et al. [83] evaluated the effects of dioctyl phthalate and mica on the sound insulation property of PVC. Based on the results, the stiffness and mass laws can describe the sound insulation property of the composites PVC/mica, and the increase of the amount of mica in the composite influenced the sound transmission loss and resonance frequency.

Liu et al. [48] adopted amino-silane modified microcrystalline muscovite as a filler in PVC matrix, performing acoustic analysis of the composites. The presence of filler improved the processing flowability, which allowed the use of higher amounts of filler and reduced the cost of the polymer matrix.

In another example, Zhang et al. [97] used mica to modify PVC/α-methylstyrene-acrylonitrile copolymer (α -MSAN)/chlorinated polyethylene (CPE) blend. By using mica, the authors obtained improvements in the thermal conductivity, flexural modulus, and overall thermal stability. The authors also found that mica has a superior interfacial interaction with the polymeric matrix. Likewise, some authors [97] examined the thermal conductivity, flexural modulus, and thermal stability of blends PVC/α-methylstyrene–acrylonitrile copolymer/chlorinated polyethylene modified by mica. Mica proved to be efficient in improving the properties analyzed. According to the theoretical modeling results, mica has a more effective potential to increase the thermal conductivity and better interfacial interaction with the polymeric matrix.

Jamel et al. [34] tried to increase the dimensional stability and mechanical properties of rigid PVC foam by adding mica. The authors found that the presence of mica improved the mechanical properties and dimensional stability of the PVC composites.

Maebayashi et al. [49] measured the velocities of longitudinal, transversal, and leaky surface skimming compressional waves of PVC/mica composites. As a result, as the concentration of mica increased, the longitudinal and transversal velocities increased.

In a different purpose, some authors [27] observed the thermal behavior and the aging effect on the ion-selective conduction of the membrane PVC/mica. The results revealed that, as the aging and the temperature increase, the ionic conduction is improved.

Based on the investigated literature, authors seem to be focused on the analysis of the dielectric [78], electrical [20, 21], mechanical [20, 21, 34, 41], and sound insulation [78, 83, 89] properties. The results are obtained by both experimental [83, 97] and theoretical [83, 97] experiments.

In the particular case of mica-filled PVC composites, it could not be a deeper analysis of the authors' keywords, as the number of occurrences of them is small.

4 Discussion and Final Considerations

Even though both are composites, the research areas of mica-filled PVC composites and glass fiber-filled PVC composites are very distinct.

First, what draws attention is the number of publications obtained as a result in the Scopus database. For glass fiber-filled PVC composites (Scopus search by using the words "composite*" AND "PVC" AND "glass fiber*"), the result was 192 documents in English, being 189 articles and 3 reviews. Whereas, for mica-filled PVC composites (Scopus search by using the words “composite*” AND “PVC” AND “mica”), the result was only 21 documents in English, being 20 articles and 1 review. From a particular point of view, the obtained results from the searches in the Scopus database show that there is a great opportunity for growth in both areas.

By analyzing the word cloud, an overview of the analyzed research area can be visualized. In the case of glass fiber-filled PVC composites, some of the most popular authors’ keywords are ‘PVC foam’, ‘sandwich composite*’, and ‘mechanical propert*’. These keywords have a huge magnitude in the literature concerning glass fiber-filled PVC composites and can be considered hotspots. They reveal the main application of the PVC concerning glass fiber-filled PVC composites in the literature: PVC in the form of foam is applicated as a core in sandwich composites (in which glass fiber is used as a property modifier), having as main application the marine branch. Concerning mica-filled PVC composites, some of the most popular authors’ keywords are ‘composite’ and ‘interface’. So, in this case, mica and PVC are used in the production of composites (PVC as matrix phase and mica as filler), including foams as glass fiber-filled PVC, in which the interface between these phases is very relevant. The literature on the subject seems to be focused on examining the influence of mica characteristics (shape, aspect ratio, concentration, surface modification, etc.) on a given property of the composite, such as sound insulation property, mechanical properties, thermal and thermal degradation properties, among others aforementioned in the last section.

While for mica-filled PVC composites the literature analyzes a wide range of different properties of composites, in the case of glass fiber-filled PVC composites the literature analyzes the mechanical properties, in general, more often. Researchers in the two areas use both experimental and numerical investigations, finding in many cases good correlations between them.

As processing methods used, in the case of glass fiber-filled PVC composites it seems that vacuum-assisted resin infusion process is more largely used by literature. In the case of mica-filled PVC, literature seems to adopt processing ways more “conventional” for polymers in the melt state such as extrusion and injection.

Concluding, with this brief discussion and comparison between glass fiber-filled PVC composites and mica-filled PVC composites it could be observed the differences and similarities between the two areas, making it clear that the differences are much greater.

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