



Cement Polymer Based Piezoelectric Composite Sensors Cement Polymer Composites SPSS Method

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Abstract

Cement Polymer Mixtures Cement, sand or bulk polymers are made using Polymers Adding to its compressive strength, fatigue resistance, impact and durability has been shown to improve Hydraulic cement polymer composites A well-known technology that creates with modern technology of polymers Cement-polymer by bonding Improved development of composite materials and fresh products It aims at both. Polymer cement new construction or old cement can be used for repairs. Adhesive properties of polymer cement Polymer and conventional cement Both based cements Allows for correction. Cement based composite materials Hardened cement paste It is based on cement and hydration between water and various mineral, metal and Formed by a combination of polymeric materials. A combination of the two mentioned above or three kinds of things may have Cement is a Binder is used for construction A chemical substance, which is other Sets to bind things together, Hardens and glues. Cement is rarely used alone, instead sand and gravel together Used to bind. Polymer cement is of conventional cementitious polymer composites Polymer cement hydrates binders or liquid adhesives by completely replacing by is a prepared mixture, and this A type of cement-polymer composite. Polymer cement is typical Cement of cement polymer composites Hydrate binders are polymer binders or completely through liquid resins A mixture prepared by replacing, and it is a kind of cement-polymer composite. Cement polymer composites are forgiving materials and a serious environment long service life at temperature The expectation is not unreasonable. In hot and cold weather Extreme temperatures in the threat Does not cause, because dry concrete Acceptable low heat has a coefficient of expansion and moderate movements can be considered in the design. Evaluation parameters: Calcium oxide, Magnesium oxide, Silicon dioxide, Aluminum oxide, Sodium oxide, Potassium oxide, sulfur trioxide.

1. Introduction

Development of cement polymer composites, of cement-like composition to expand the range of applicability The opportunity is open. Polymer Cementitious admixtures are acids and for chemicals such as salt solutions Cement polymer composites in resisting are much higher than Polymer-enriched Ferrocement, a thin, lightweight and A more persistent mix is coastal, Coastal and Chemical Industry It has great potential for use in structures. Polymer-cement composites are very Cost effective, high durability and require chemical resistance and here so far, expensive Materials and compounds used. Developing countries in this situation Inefficient construction materials Used or expensive Mistaking employment for substitutes may use Polymer Cement Polymer Compounds Food Processing, Chemical industries, wear-resistant Over floors and steel brides Flooring is used in layers. Because of the early development of strength, to repair the marine defense structure It is very appropriate. Modern construction Materials engineering improves durability Creating objects with intended, its use Necessary repair of cement structures will be less. repair Material that facilitates the process and Technological solutions are also being sought. Repairs already in use Materials and self-healing for new products with capacity Concepts are both cement-polymer are based on compounds. Polymers are resistant to chemical agents, but their microbiological resistance Varies, for example, less than 500 Short chain with molecular weight All if containing oligomers Polylefins also promote the growth of fungi encourage. For polyesters, microbiol the degradation limit is 60 molecular weights. In recent years, polyether containing polyesters rather than polyurethanes Polyurethanes are highly susceptible to microbial degradation Being easily affected has been proven. In the early 1900s in manufacturing building materials from Cement mixtures are used. Oil and gas well Cement used for construction Materials penetrated into the well underground to isolate systems permanently to isolate systems permanently Have or permanently fill the wells when abandoned.

2. Cement polymer composites

Cement in wellbore scenarios Deterioration of casing adhesion, unnecessary and may cause harmful leakage, and heavy repair costs occur. In this work, the authors to bring about self-healing One way is regular wellbore Self-healing added to cements Explore the use of polymers and the casing in the herring mixture Studying properties. Polymer-cement Admixtures are cement aggregates and cement 50-70% of the flow at the steel interface Penetration showing that they reduce Self-healing through analysis Proven ability. of atomic simulations Application These polymers are steel good surface wetting properties indicates that they have Steel Polymer and Cement/Polymer The connections between Complementary, consequently A wide range of binding patterns [1]. In a pressurized water reactor of liquid waste generated from the main component is boric acid (H_3BO_4). Such furnaces annually produce approx 50,000-gallon boric acid evaporator create Boric acid Wastes are mostly sodium using hydroxide Neutralized and then by evaporation concentrated. As a result, Borate emulsion is usually cement, polymer, In bitumen or cement-polymer composites Be still. Solidified Long term of radioactive waste forms Proactive Radioactive Waste Management It is an important part of research. remove Environmental impacts occur over time. Extreme weather and other conditions Accelerated instead of simulated Real-time, using aging testing Observations are of different nature Final for many years under the conditions Actual aging of the waste form can be followed [2]. In reinforced cement (RC) structures to delay the onset of corrosion, Cement for coating steel rebars Polymer-composites are widely used. However, cement-polymer-composite (CPC) The coating is sometimes on rusted steel Underutilized, foil Expansive erosion may occur prematurely. CPC in service life of RC structures such as coating and premature corrosion This article examines the effect of insufficient applications investigates. For this, the maximum surface area Chloride concentrations, diffusion coefficients and chloride limits Derived from a bridge that is years old samples and prepared in the laboratory Determined by a one-year laboratory study [3]. will be uniformly distributed in the cement The presence of highly flexible polymer, Experimental and density-functional as confirmed by calculations, 440 60-70% higher tensile for composite material Brings flexibility. Considerably high tensile strength High ductility for composite material gives Cement Ductility, Recently Along with the reported self-healing ability, Bone as a result of mechanical stress to reduce the formation/propagation of fractures is of critical importance. This cement-polymer in geothermal wells Using composites, the well fails and related to intervention Environmental and economic issues should/must reduce [4]. Self-healing cement and epoxy the latest in polymer composites Stimulated by developments, calcium-silicate of the hydrate/polymer interface assoc ab initio molecular dynamics and bulk Frequency Generation (SFG) Spectroscopy Presenting the survey [5]. Cement is clay and limestone Starting from the ingredients of the mixture, contains magnesium and iron impurities of the sintered mass of the $CaO-SiO_2-Al_2O_3$ system Grinding of unbalanced cooling is the product. 19 It is of many minerals A mixture. phases, impure tricalcium Silicate, $3CaO SiO_2$ Alide. Cement When mixed with water, it is a solvent reacts with, among others, Calcium, silicate and aluminate forming ions in the intermediate solution, Microstructural polymer of MDF materials by grains of cement not embedded in the matrix classified. micro of hydrates Contains crystals, anhydrous with water Products of the reaction of cement. Hardened without polymer larger pores than cement Eliminating is more flexibility for the material Gives strength [6]. As penetration depth increases the scratch test is a ductile-brittle Drives change. Scanning Electron Microscopy imaging low porosity and strong cement-binder Intermediate are crack trapping and bridging For difficult procedures such as Shows positive. Linear Theory of Nonlinear Fracture Mechanics Breakdown in the fracture-driven regime Gives hardness. polymer-to- As the cement ratio increases Macro-defect free (MDF) The fracture toughness of cement decreases. Anhydrous cement lacks this fracture resistance By decreasing content, cement Intergrain It can also be explained by the increase in inter-particle distance. The microstructure of MDF cement By evaluating the fracture toughness, Fracture at composite level The higher the hardness value, the harder calcium aluminate phases and Granular micropores without overcrowded pores We show that structure arises from [7]. For oil and gas well construction Cement materials used Underground systems penetrated by wells require permanent isolation or Permanent wells when abandoned to be filled. So, they are good Great like mechanical and durability Scale characteristics should be expressed. Polymer powder/cement mixtures are typical Cement based products Higher tensile strength, deformation, Adhesive, waterproof and durable Known to contain For this reason, polymer Modified cements in construction industry Used, for example, in repairs materials, corrosion coatings or tile Adhesives. In addition, suitable polymer particles Addition, mechanical and durability Lighten emulsions without affecting them A way to do it. This Reasons are all polymer powder/cement Oil well the compounds Makes interesting materials for cementing [8]. Absorbable polymer-absorbed theoretical water Semi-powdered cements with requirements Homogeneity was ascertained by mixing and absorbable polymer-cement of absorbent polymer-cement composites Primary mean aperture Size is about 0.1mm hole radius [9] Cement polymer composite macro-Defect Free MDF Cement 1980 The main ingredient of lava is cement, and is usually 80% solid Composites are made of cement. In the mix small amounts of polymer and water were also added. Created in the early This In addition, the plasticity of composites Especially glycols to increase Glycerol is often used. MDF composites from rubber manufacturing Produced with an inspired method, It consists of two rollers of elastic-plastic compound sent between plants. High shear during this process

Powers eliminates macro voids. The obtained product is then moderated Pressed under pressure and temperature [10]. Particulate polymer composites are multi-structure and used in electrical applications of advanced reinforced materials Important category, they are relevant Natural fillers in polymer matrix to connect. of these fillers Examples are natural minerals and clay, zeolite, mica, talc and deposits such as rocky shale, In conjunction with a competent affiliate agent and to receive designed reinforcement Also to optimize the cost of asset balance is However, some physical and chemical factors Machining of manufactured compounds and affect electrical performance, ie processing conditions, filler and The type of polymeric matrix is both and nature and their interfacial adhesion capacity. As a result, filled with nature Polymer composites are multi-constructed Widely adopted in applications [11]. Modern Building Materials Engineering Materials with improved durability aims to create Its application is in cement structures Repairs required will be minimal. Facilitates the repair process Material and technical solutions are sought. already in use Repair items and self-New with healing powers Both are concepts for objects Cements are based on polymer compounds [12]. Cement-polymer composite materials Their purpose in the building complex have different requirements depending on properties of existing ones Regulate and fresh dry mixes of theoretical evidence to develop For methods, of functional combinations Choice of a binder, a filler It is important to know the principles. Additions of polymers Composition of functional groups and their degree of polymerization Special attention should be paid to [13]. Currently, piezoelectric materials Structural analysis using or Monitoring methods can be classified into three categories, ie piezoelectric strain technology, Wave Transmission Technology and Electro Mechanical Impedance (EMI) Technology. EMI technology is Electric of piezoelectric sensor Impedance frequency spectrum Based on variation As a form of surveillance, It is mechanical engineering, civil engineering and in aerospace engineering fields Shows potential use case [14] Destruction in recycling plants and its Large size and low density Takes up space on the landscape due to ratio. Looking for value-added products, Bridge Decks, prefabricated curtains, Wall panels, floor blocks and Can be used as overlays for many, Chemical attacks, acceptable mechanical life and others [15]. Recycled post-consumer Polystyrene foam waste and From Portland cement Formed cement-polymer Mixed, lab-scale of sulfate simulated in experiments Waste Solidification/Stabilization (S/S) as the integral matrix for proposed. Water-flood incident To follow, the solid waste achieved Form tap, ground- and sea water Up to 420 days in all three types of water In full for incremental periods drowned of various immersion periods Finally solidified waste Compressive strength, porosity of samples and mass conversion were evaluated [16]. Polymers are commonly used in cementitious mixtures An aqueous solution or styrene Butadiene rubber latex, epoxy resin and polyacrylamide-like re are incorporated into dispersible powder forms, Acrylic resin modified cement Analyze and summarize mechanical behavior found strength. and of compounds The elastic modulus is 30% and 27% respectively, normal Improved compared to cement. To replace cement mortar A new epoxy emulsion and In terms of compressive and flexural strength Progress has been made. To reinforce Portland cement Polyvinylpyrrolidone in water Soluble polymers were used, in which Bone due to increase in molecular mass Improved breaking pressure and energy [17]. The main building compounds are cement and is the motor. In recent years, Success of cement industry and manufacture of cement and mortar Advancement in technology have improved their quality. However, traditional cement production Using technology, Its porosity is difficult to reduce, Because of excess water Need to add. Its By nature, cement stone is porous material, and under normal conditions The size of the neoplasms is of solid phase Not enough to fill the initial void [18]. Styrene Butadiene, Acrylic Ester and vinyl ester respectively 45, 40 and 25 kilograms of EP-radiation The flexural strength obtained in sizes and Maximum values of modulus of elasticity. Impact strength of composites above 10 kGy Not significantly improved. of radioactive compounds Not significantly improved. radioactive Average values of hardness of composites Non-radioactive and controlled was more than compounds [19]. Recycled polymer waste In addition to cement mixtures Various researches have focused on Plastic waste to reinforce cement Shredded PET water from streams Bottles, adding more fiber A further decrease in strength was found by In waste streams in cement mixtures Shredded PET water from Used bottles, earthquake by fibers to prevent loading Woven fiberglass cement By including mixts Reduced plastic shrinkage cracking or different fiber types Cement mixtures containing and flexural strength. Polymer composites Controlling cement using Compressive strength and structural strength Useful for improving character [20].

2.1. Calcium oxide

Calcium oxide (CaO), in general Called lime or quicklime is called, it is widely used is a chemical compound. This is the room White, caustic, alkaline, crystalline at temperature is a solid. Widely used The word lime means containing calcium refers to mineral substances, including calcium, Silicon, magnesium, aluminum and carbonates of iron, Oxides and hydroxides predominate are paying Instead, quicklime Especially the single chemical compound calcium Applies to oxide. such as cement Non-reactive processing in building materials Calcium oxide is called free lime is called Quicklime is comparable Cheaper. It and a chemical derivative Calcium hydroxide, including quicklime are basic anhydrides are important commodity chemicals.

2.2. Magnesium oxide

Magnesium is what your body normally does An element that needs to function. Magnesium oxide for a variety of reasons can be used. Some have heartburn, Sour stomach or acid indigestion Used as an antacid to relieve pain. Magnesium oxide, for surgery Before, for short-term, rapid emptying of the bowels Can also be used as a laxative,

for example. It should not be used repeatedly. Adequate amounts of magnesium in the diet In the absence of magnesium oxide a Also used as a food additive. Magnesium oxide is available without a prescription. Magnesium oxide as a tablet, , also available as a capsule. Any brand Used and in which position you are It depends on where you are Usually one to four daily method is taken. in the package instructions or your prescription Follow the instructions on the slip label Follow carefully, you don't understand Explain any part of your Ask your doctor or pharmacist. Properly administered magnesium oxide Take it. Your doctor More than recommended or don't settle for less or don't take it too often.

2.3. Silicon dioxide

Silicon dioxide is silicon and natural of oxygen It is a chemical compound that is used in many foods as an anticaking agent in ingredients is used. Silicon dioxide Generally safe as a food additive, however some agencies in foods of silicon dioxide found Regarding quality and characteristics demanding strict guidelines.

2.4. Aluminum oxide

Aluminum oxide is Al₂O₃ with the chemical formula of aluminum and oxygen is a chemical compound. It is many Most commonly occurs in aluminum oxides and aluminum in particular is identified as an oxide. It is commonly known as alumina and specific forms or Alaxide or Alundum depending on the applications Also known as it is natural α-Al₂O₃ in its crystalline polymorphic phase Occurs as the mineral corundum, of which Varieties Precious Gemstones Ruby and form sapphires. Al₂O₃ is aluminum metal Notable in producing, its Abrasion due to hardness as a substance, high melting point as a result, it is a useless item.

2.5. Sodium oxide

Sodium oxide is Na₂O is a chemical compound with the formula It's on ceramics and glass is used. It is a white A solid but rarely a compound is faced. instead, Sodium oxide, sodium and others containing oxides containing elements Like glasses and fertilizers Components of various products Used to describe. Sodium oxide What is sodium oxide glass and in the manufacture of ceramic products is used. Anhydrous sodium By adding water to the oxidn It is also used in the production of sodium hydroxide.

2.6. Potassium oxide

Potassium oxide (K₂O) is of potassium and oxygen is an ionic compound. This is a basic. This light-yellow solid is of potassium is the simplest oxide. This is A highly reactive compound, It is rarely seen. Fertilizers And some like cements for industrial products, K₂O Assuming equal percentage composition are evaluated.

2.7. Sulfur trioxide

Sulfur trioxide alternative spelling Sulfur trioxide, Nisso Also known as sulfon, It has the formula SO₃ is a chemical compound. It is "for doubt Very economically without space Described as important" sulfur oxide. It is a precursor to sulfuric acid Produced on an industrial scale. Sulfur trioxide is many exists in the forms gaseous monomer, crystalline trimer and solid polymer. Sulfur Dry Oxide is relatively short A chamber with a liquid limit is a solid below temp. The gas SO₃ is the primary precursor to acid rain.

3. Results and Discussion

TABLE 1. Reliability Statistics

Reliability Statistics		
Cronbach's Alpha	Alpha Based on Standardized Items	N of Items
.686	.690	7

Table 1 shows the Cronbach's Alpha Reliability result. The overall Cronbach's Alpha value for the model is .686 which indicates 68% reliability. From the literature review, the above 69% Cronbach's Alpha value model can be considered for analysis.

TABLE 2. Reliability Statistic individual

	Cronbach's Alpha if Item Deleted
Calcium oxide	0.642
Magnesium oxide	0.68
Silicon dioxide	0.637
Aluminum oxide	0.598
Sodium oxide	0.613
Potassium oxide	0.637
sulfur trioxide	0.729

Table 2 Shows the Reliability Statistic individual parameter Cronbach's Alpha Reliability results Calcium oxide 0.642, Magnesium oxide 0.68, Silicon dioxide 0.637, Aluminum oxide 0.598, Sodium oxide 0.613, Potassium oxide 0.637, sulfur trioxide 0.729.

TABLE 3. Descriptive Statistics

	N	Range	Minimum	Maximum	Sum	Mean		Std. Deviation	Variance
Calcium oxide	20	4	1	5	60	3.00	.241	1.076	1.158
Magnesium oxide	20	4	1	5	59	2.95	.246	1.099	1.208
Silicon dioxide	20	4	1	5	62	3.10	.315	1.410	1.989
Aluminum oxide	20	4	1	5	61	3.05	.235	1.050	1.103
Sodium oxide	20	4	1	5	68	3.40	.320	1.429	2.042
Potassium oxide	20	4	1	5	70	3.50	.303	1.357	1.842
sulfur trioxide	20	4	1	5	64	3.20	.277	1.240	1.537
Valid N (listwise)	20								

Table 3 shows the descriptive statistics values for analysis N, range, minimum, maximum, mean, standard deviation, Variance, Skewness, Kurtosis. Calcium oxide, Magnesium oxide, Silicon dioxide, Aluminum oxide, Sodium oxide, Potassium oxide, sulfur trioxide this also using.

TABLE 4. Frequency Statistics

Frequency Statistics								
		Calcium oxide	Magnesium oxide	Silicon dioxide	Aluminum oxide	Sodium oxide	Potassium oxide	sulfur trioxide
N	Valid	20	20	20	20	20	20	20
	Missing	4	4	4	4	4	4	4
Median		3.00	3.00	3.00	3.00	3.00	3.00	3.00
Mode		3	3	3	3	5	5	3
Percentiles	25	3.00	2.00	2.00	3.00	2.00	2.25	3.00
	50	3.00	3.00	3.00	3.00	3.00	3.00	3.00
	75	4.00	3.00	4.75	3.75	5.00	5.00	4.00

Table 4 Show the Frequency Statistics in Cement polymer composites is Calcium oxide, Magnesium oxide, Silicon dioxide, Aluminum oxide, Sodium oxide, Potassium oxide, sulfur trioxide curve values are given. Valid 20, Missing value 4, Median value 3.00, Mode value 3.

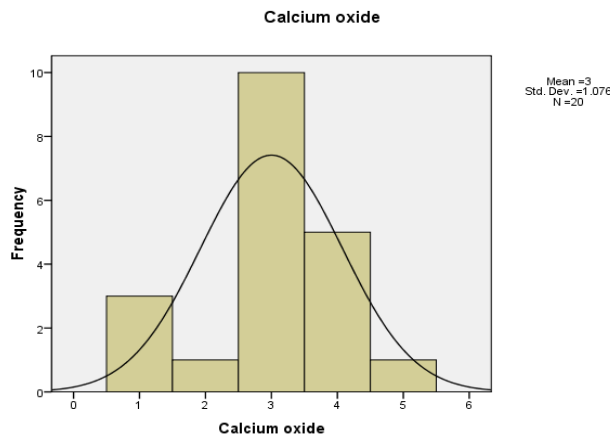


FIGURE 1. Calcium oxide

Figure 1 shows the histogram plot for Calcium oxide from the figure it is clearly seen that the data are slightly Bell karo due to more respondent chosen 3 for Calcium oxide except the 2 value all other values are under the normal curve shows model is significantly following normal distribution.

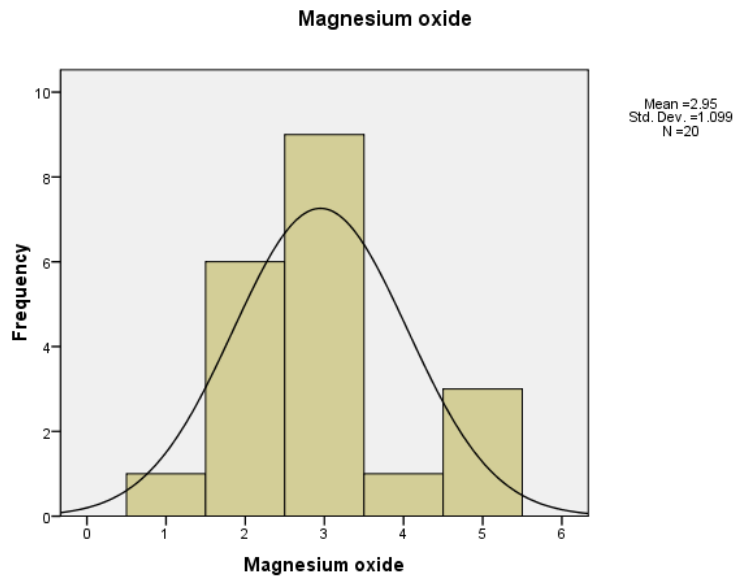


FIGURE 2. Magnesium oxide

Figure 2 shows the histogram plot for Magnesium oxide from the figure it is clearly seen that the data are slightly Right skewed due to more respondent chosen 3 for Magnesium oxide except the 2 value all other values are under the normal curve shows model is significantly following normal distribution.

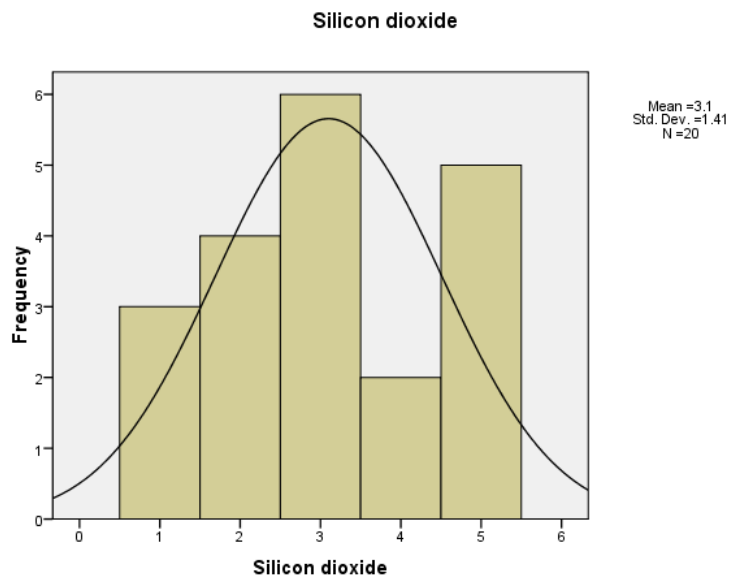


FIGURE 3. Silicon dioxide

Figure 3 shows the histogram plot for Silicon dioxide from the figure it is clearly seen that the data are slightly Left skewed due to more respondent chosen 3 for Silicon dioxide except the 3 value all other values are under the normal curve shows model is significantly following normal distribution.

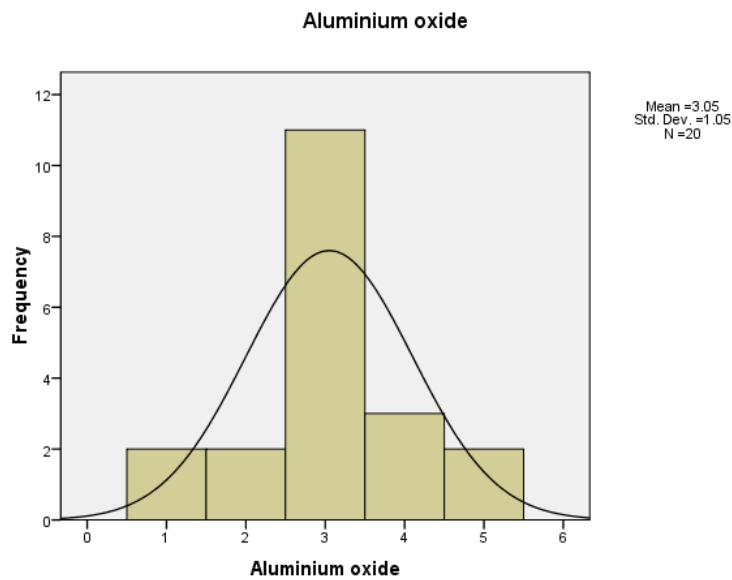


FIGURE 4. Aluminum oxide

Figure 4 shows the histogram plot for Aluminium oxide from the figure it is clearly seen that the data are slightly Bell karo due to more respondent chosen 3 for Aluminium oxide except the 3 value all other values are under the normal curve shows model is significantly following normal distribution.

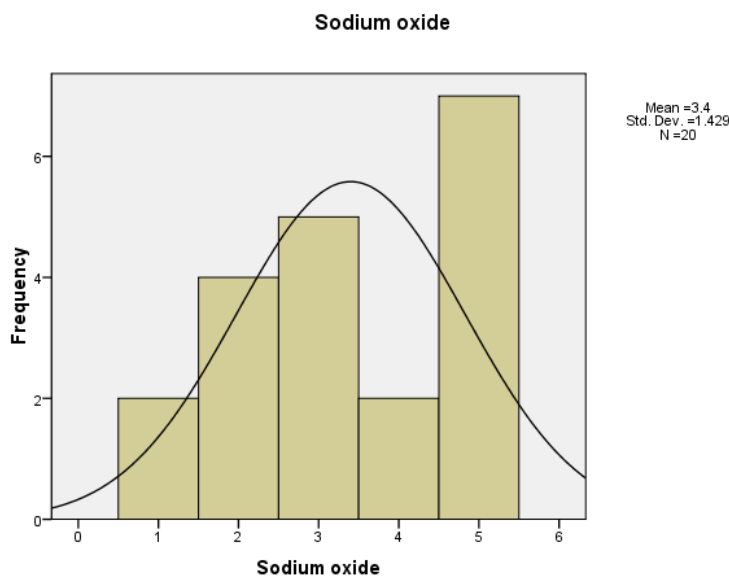


FIGURE 5. Sodium oxide

Figure 5 shows the histogram plot for Sodium oxide from the figure it is clearly seen that the data are slightly Left skewed due to more respondent chosen 5 for Sodium oxide except the 2 value all other values are under the normal curve shows model is significantly following normal distribution.

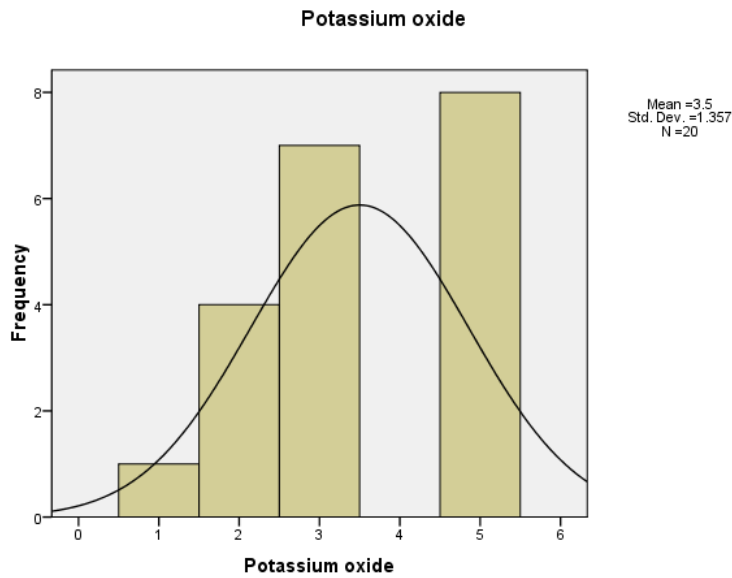


FIGURE 6. Potassium oxide

Figure 6 shows the histogram plot for Potassium oxide from the figure it is clearly seen that the data are slightly Left skewed due to more respondent chosen 5 for Potassium oxide except the 1 value all other values are under the normal curve shows model is significantly following normal distribution.

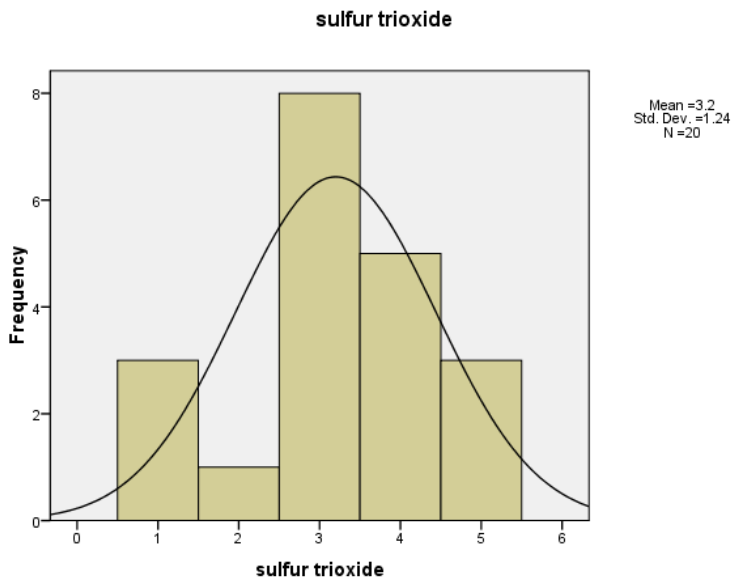


FIGURE 7. sulfur trioxide

Figure 7 shows the histogram plot for sulfur trioxide from the figure it is clearly seen that the data are slightly Left skewed due to more respondent chosen 3 for sulfur trioxide except the 2 value all other values are under the normal curve shows model is significantly following normal distribution.

Table 5 shows the correlation between motivation parameters for Calcium oxide For Aluminum oxide is having highest correlation with Potassium oxide is having lowest correlation. Next the correlation between motivation parameters for styrene Magnesium oxide For Sodium oxide is having highest correlation with sulfur trioxide is having lowest correlation. Next the correlation between motivation parameters for styrene Silicon dioxide For

Aluminum oxide is having highest correlation with Potassium oxide is having lowest correlation. Next the correlation between motivation parameters for styrene Aluminum oxide For Silicon dioxide is having highest correlation with Magnesium oxide is having lowest correlation.

TABLE 5. Correlations

Correlations							
	Calcium oxide	Magnesium oxide	Silicon dioxide	Aluminum oxide	Sodium oxide	Potassium oxide	sulfur trioxide
Calcium oxide	1	0.223	0.173	0.373	0.308	0.36	0.158
Magnesium oxide	0.223	1	0.241	0.185	0.315	0.3	-0.263
Silicon dioxide	0.173	0.241	1	.494*	0.319	0.137	0.259
Aluminum oxide	0.373	0.185	.494*	1	0.337	0.277	.477*
Sodium oxide	0.308	0.315	0.319	0.337	1	.624**	-0.107
Potassium oxide	0.36	0.3	0.137	0.277	.624**	1	-0.125
sulfur trioxide	0.158	-0.263	0.259	.477*	-0.107	-0.125	1
*. Correlation is significant at the 0.05 level (2-tailed).							
**. Correlation is significant at the 0.01 level (2-tailed).							

Next the correlation between motivation parameters for styrene Sodium oxide For Potassium oxide is having highest correlation with sulfur trioxide is having lowest correlation. Next the correlation between motivation parameters for styrene Potassium oxide For Sodium oxide is having highest correlation with sulfur trioxide is having lowest correlation. Next the correlation between motivation parameters for styrene sulfur trioxide For Aluminum oxide is having highest correlation with sulfur trioxide is having lowest correlation.

4. Conclusion

Polymer cement is typical Cement hydrate of cement Binders are polymer binders or with liquid resins Produced by complete conversion is composite material, and this A type of cement-polymer composite. Polymer cement is a composite is cement, which is within the binding material Contains synthetic polymer. Polymer cement has high properties, Low power requirements and Low labor costs has the advantages of Polymer concrete in the late 1950s introduced and in the 1970s Repairs, thin overlays and In platforms and precast elements It is well known for its use. Polymer-modified concrete There are many benefits to using it Increased strength and durability In Strength Mixture of Concrete with the amount of water used related to Water-cement ratio Decreasing increases strength, Also polymer-modified With concrete, less water is required. As good as concrete is, it is perfect Not. Many conditions are concrete Worse, it's cosmetic issues Or a more extreme structure leading to failures. the Cronbach's Alpha Reliability result. The overall Cronbach's Alpha value for the model is .686 which indicates 68% reliability. From the literature review, the above 69% Cronbach's Alpha value model can be considered for analysis.

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