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Antifoaming Agents (Review)

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Abstract : Antifoaming agents are additives that are added to liquids, liquids-solid suspensions, and gases to prevent the formation of foam. They are widely used in various industrial processes, such as oil refining, chemical manufacturing, food processing, and pharmaceuticals, to improve the process efficiency and product quality. Antifoaming agents can act by reducing the surface tension of liquids, promoting the coalescence of bubbles, and inhibiting the growth of bubbles. There are two main types of antifoaming agents, silicone-based and non-silicone-based. Silicone-based antifoaming agents are widely used due to their stability, high temperature resistance, and non-toxicity. They are commonly used in food and pharmaceuticals, where the requirements for antifoaming agents are strict. However, silicone-based antifoaming agents can have adverse effects on the environment and biodegradability, so there is a growing interest in developing non-silicone-based antifoaming agents. Non-silicone-based antifoaming agents are usually derived from renewable sources and have lower toxicity. They can be classified into several categories, such as fatty acid esters, alcohols, surfactants, and polysaccharides. Fatty acid esters, such as glycerol monostearate, are commonly used in food and cosmetic applications, while alcohols, such as ethanol and isopropanol, are widely used in industrial processes. Surfactants, such as sodium lauryl sulfate and polysorbates, are used in food and pharmaceuticals, while polysaccharides, such as xanthan gum, are used in oil and gas drilling. In conclusion, antifoaming agents play an important role in improving the efficiency and quality of various industrial processes. Silicone-based antifoaming agents are widely used, but there is a growing trend towards non-silicone-based antifoaming agents due to their lower toxicity and environmental impact. Further research is needed to develop antifoaming agents with improved performance and biodegradability. Antifoaming agents are additives that are added to liquids, liquids-solid suspensions, and gases to prevent the formation of foam. They are widely used in various industrial processes, such as oil refining, chemical manufacturing, food processing, and pharmaceuticals, to improve the process efficiency and product quality. Antifoaming agents can act by reducing the surface tension of liquids, promoting the coalescence of bubbles, and inhibiting the growth of bubbles. There are two main types of antifoaming agents, silicone-based and non-silicone-based. Silicone-based antifoaming agents are widely used due to their stability, high temperature resistance, and non-toxicity. They are commonly used in food and pharmaceuticals, where the requirements for antifoaming agents are strict. However, silicone-based antifoaming agents can have adverse effects on the environment and biodegradability, so there is a growing interest in developing non-silicone-based antifoaming agents. Non-silicone-based antifoaming agents are usually derived from renewable sources and have lower toxicity. They can be classified into several categories, such as fatty acid esters, alcohols, surfactants, and polysaccharides. Fatty acid esters, such as glycerol monostearate, are commonly used in food and cosmetic applications, while alcohols, such as ethanol and isopropanol, are widely used in industrial processes. Surfactants, such as sodium lauryl sulfate and polysorbates, are used in food and pharmaceuticals, while polysaccharides, such as xanthan gum, are used in oil and gas drilling. In conclusion, antifoaming agents play an important role in improving the efficiency and quality of various industrial processes. Silicone-based antifoaming agents are widely used, but there is a growing trend towards non-silicone-based antifoaming agents due to their lower toxicity and environmental impact. Further research is needed to develop antifoaming agents with improved performance and biodegradability. Antifoaming agents work by reducing surface tension, promoting bubble coalescence, and inhibiting bubble growth. The specific chemical reactions involved in these mechanisms depend on the type of antifoaming agent and the system it is used in. Silicone-based antifoaming agents work by adsorbing at the liquid-air interface and reducing the surface tension. This reduces the energy required to form new bubbles and promotes the coalescence of existing bubbles. Non-silicone-based antifoaming agents, such as fatty acid esters, alcohols, surfactants, and polysaccharides, work by different mechanisms. For example, surfactants can reduce surface tension by adsorbing at the liquid-air interface and changing the interfacial properties. Alcohols can dissolve in the liquid phase and reduce the surface tension. Fatty acid esters can reduce the viscosity of the liquid phase, which reduces the energy required to form new bubbles. Polysaccharides can form viscoelastic networks that inhibit bubble growth. In summary, the specific chemical reactions involved in antifoaming agents depend on the type of antifoaming agent and the system it is used in, but they all aim to reduce surface tension, promote bubble coalescence, and inhibit bubble growth.

***IndexTerms* – Antifoaming, Defoaming, Applied Chemistry.**

I. INTRODUCTION

1- Introduction : A foam is a substance that's formed by enmeshing pockets of gas in a liquid or solid. A bath sponger and the head on a glass of beer are samples of foam. In utmost foam, the volume of gas is large, with thin flicks of liquid or solid separating the regions of gas. An important division of solid lathers is into unrestricted- cell foams and open- cell foams. In a unrestricted- cell foam, the gas forms separate pockets, each fully girdled by the solid material. In an open- cell foam, the gas pockets connect with each other. A bath sponger is an illustration of an open- cell foam water can fluently flow through the entire structure, displacing the air. A camping mat is an illustration of a unrestricted- cell froth the gas pockets are sealed from each other, and so the mat can not soak up water. Foams are examples of dispersed media. In general, gas is present in large amount so it'll be divided in gas bubbles of numerous different sizes(the material is poly disperse) separated by liquid regions which may form flicks, thinner and thinner when the liquid phase is drained out of the system flicks. When the top scale is small, i.e. for a veritably fine foam, this dispersed medium can be considered as a type of colloid.

II. 2- Structure of spumes Cappuccinos are outgunned with a subcaste of fumed- milk spume. A spume is in numerous cases a multi scale system. One scale is the bubble one real- life lathers are generally disordered and have a variety of bubble sizes. At larger sizes, the study of idealized lathers is nearly linked to the fine problems of minimum shells and three- dimensional tessellations, also called honeycombs. The Weaire- Phelan structure is believed to be the stylish possible(optimal) unit cell of a impeccably ordered froth, while Plateau's laws describe how cleaner- flicks form structures in spumes. At lower scale than the bubble one, is the consistence of the film for dry enough spumes, which can be considered as a network of connected flicks called plates. immaculately, the plates are connected by three and radiate 120 ° outward from the connection points, known as Plateau borders. An indeed lower scale is the one of the liquid- air interface at the face of the film. utmost of the time this interface is stabilized by a subcaste of amphiphilic structure, frequently made of surfactants, patches(Pickering conflation), or more complex associations.

III. 3- Raging and froth stability Several conditions are demanded to produce froth there must be mechanical work, face active factors(surfactants) that reduce the face pressure, and the conformation of froth briskly than its breakdown. To produce froth, work(W) is demanded to increase the face area Stabilization of froth is caused by van der Waals forces between the motes in the froth, electrical double layers created by dipolar surfactants, and the Marangoni effect, which acts as a restoring force to the plates. Several destabilizing goods can break froth down i) solemnity causes drainage of liquid to the froth base, (ii) Bibulous pressure causes drainage from the plates to the Plateau borders due to internal attention differences in the froth, while iii) Laplace pressure causes prolixity of gas from small to large bubbles due to pressure difference. flicks can break under decoupling pressure, These goods can lead to rearrangement of the froth structure at scales larger than the bubbles, which may be individual (T1 process) or collaborative(indeed of the" avalanche" type).

IV. 4-Trials and characterizations Being a multi scale system involving numerous marvels, and a protean medium, froth can be studied using numerous different ways. Considering the different scales, experimental ways are diffraction bones substantially light scattering ways(DWS, see below, static and dynamic light scattering, X shafts and neutron scattering) at submicronic scales, or bitsy bonesConsidering the system as nonstop, its bulk parcels can be characterized by light transmittance but also conductimetry. The correlation between structure and bulk is substantiated more directly by acoustics in particular. The association between bubbles has been studied numerically using successional attempts of elaboration of the minimal face energy either at arbitrary(Pott's model) or deterministic way face evolver). The elaboration with time, i.e. the dynamics, can be dissembled using these models, but also the bubble model(Durian) which considers the stir of individual bubbles. Among possible exemplifications, low scale compliances of the structure done using reflectivity by the flicks between bubbles, of radiation, ponctual using ray or X shafts shafts, or further global using neutron scattering. A typical light scattering(or prolixity) optic fashion is multiple light scattering coupled with perpendicular scanning is the most extensively used fashion to cover the dissipation state of a product, hence relating and quantifying destabilization marvels.(2(3(4(5 It works on any concentrated dissipations without dilution, including lathers. When light is transferred through the sample, it's backscattered by the bubbles. The backscattering intensity is directly commensurable to the size and volume bit of the dispersed phase. thus, original changes in attention(drainage, syneresis) and global changes in size(growing, coalescence) are detected and covered.

V. 5- Operations 5 ± 1- Liquid lathers Liquid lathers can be used in fire retardant froth, similar as those that are used in extinguishing fires, especially oil painting fires. In some ways, leavened chuck is a froth, as the incentive causes the chuck to rise by producing bitsy bubbles of gas in the dough. immaculately, the dough is a unrestricted- cell froth, in which the gas pockets don't connect with each other. Cutting the dough releases the gas in the bubbles that are cut, but the gas in the rest of the dough can not escape. still, If the dough is allowed to rise too far, it becomes an open- cell froth, in which the gas pockets are connected. Now, if dough is cut or the face else broken, a large volume of gas can escape, and the dough collapses. The open structure of an over- risen dough is easy to observe rather of conforming of separate gas bubbles, the dough consists of a gas space filled with vestments of the flour/ water paste. The unique property of gas- liquid lathers having veritably high specific face area are exploited in the chemical processes of head flotation and froth separation. 5 ± 2-Solid lathers Solid lathers form an important class of featherlight cellular engineering accoutrements . These lathers can be classified into two types grounded on their severance structure open- cell-structured lathers(also known as reticulated lathers) and closed- cell lathers. Open- cell- structured lathers contain pores that are connected to each other and form an connected network that's fairly soft. Open- cell lathers will fill with whatever they're girdled with. If filled with air, a fairly good insulator is the result, but, if the open cells fill with water, sequestration parcels would be reduced. Froth rubber is a type of open- cell froth. Closed- cell lathers don't have connected pores. The unrestricted- cell lathers typically have advanced compressive strength due to their structures. still, unrestricted- cell lathers are also in general thick, bear further material, and as a consequence are more precious to produce. The unrestricted cells can be filled with a technical gas to give bettered sequestration. The unrestricted- cell structure lathers have advanced dimensional stability, low humidity immersion portions, and advanced strength compared to open- cell- structured lathers. All types of froth are extensively used as core material in sandwich- structured compound accoutrements . From the early 20th century, colorful types of especially manufactured solid lathers came into use. The low viscosity of these lathers made them excellent as thermal insulators and flotation bias, and their lightness and compressibility made them ideal as packing accoutrements and paddings. 5 ± 3- Syntactic froth A special class of unrestricted- cell lathers is known as syntactic froth, which contains concave patches bedded in a matrix material. The spheres can be made from several accoutrements , including glass, ceramic, and polymers. The advantage of syntactic lathers is that they've a veritably high strength- to- weight rate, making them ideal accoutrements for numerous operations, including deep- ocean and space operations. One particular syntactic froth employs shape memory polymer as its matrix, enabling the froth to take on the characteristics of shape memory resins and compound accoutrements ; i.e., it has the capability to be reshaped constantly when hotted

VI. above a certain temperature and cooled. Shape memory lathers have numerous possible operations, similar as dynamic structural support, flexible froth core, and expandable froth filler. 5 ± 4-Integral skin froth Integral skin froth, also known as tone- skin froth, is a type of froth with a high- viscosity skin and a low- viscosity core. They can be formed in an open- earth process or a unrestricted- earth process. In the open- earth process, two reactive factors are mixed and poured into an open earth. The earth is also closed and the admixture is allowed to expand and cure. exemplifications of particulars produced using this process include arm rests, baby seats, shoe soles, and mattresses. The unrestricted- earth process, further generally known as response injection molding (hem), injects the mixed factors into a unrestricted earth under high pressures.

VII. 6- De raging Froth, in this case meaning" gamesome liquid", is also produced as an frequently- unwanted by- product in the manufacture of colorful substances. For illustration, froth is a serious problem in the chemical assiduity, especially for biochemical processes. numerous natural substances, for illustration proteins, fluently produce froth on agitation and/ or aeration. Froth is a problem because it alters the liquid inflow and blocks oxygen transfer from air(thereby precluding microbial respiration in aerobic turmoil processes). For this reason,anti- raging agents, like silicone canvases , are added to help these problems. Chemical styles of froth control aren't always asked with respect to the problems(i.e., impurity, reduction of mass transfer) they may beget especially in food and pharmaceutical diligence, where the product quality is of great significance. In order to help froth conformation, in similar cases mechanical styles are substantially dominant over chemical bones.

VIII. RESEARCH PAPER EXPERIMENT REVIEW:

References to given experiments provided below.

Assesment of foam generation in presence of crude oil and concrete respectively .

On Crude Oil:

whe'use'of'foams'is'a'promising'technique'to'overcome'gas'mobility'challenges'in'petroleum'reservoirsA'Koam'reduces'the'gas'mobility' by'increasing'the'gas'apparent'viscosity'and'reducing'its'relative'permeabilityA'C'major'challenge'facing'foam'application'in'reservoirs'is 'its'longterm'stabilityA'Koam'eectiveness'and'stability'depends'on'several'factors'and'ill'typically'diminish'over'time'due'to'degradation'a s'ell'as'the'foam-rock-oil'interactionsA'In'this'study,'the'eect'of'crude'oil'on'-foam'stability'and'mobility'ill'be'investigated'using'in use'build'microuidics'system'developed'for'rapid'prescreening'of'chemical'formulationsA'wo-phase'o'emulsication'test'(oil-urfactant'solutions)'and'dynamic'foam'tests'(in'the' absence'and'presence'of'crude'oil)'ere'conducted'to'perform'a'comparative'assessment'for'dierent'surfactant'solutionsA'C'microuidics'de vice'as'used'to'evaluate'the'foam'strength'in'the'presence'and'absence'of'crude'oilA'whe'assessment'as'conducted'using've'surfactant'for mulations'and'dierent'oil'fractionsA'whe'role'of'foam'quality'(volume'of'gas/total'volume)'on'foam'stability'as'also'addressed'in'this'stud yA'whe'mobility'reduction'factor'(MRK)'for'-foam'as'measured' n'the'absence'and'presence'of'crude'oil'using'high'salinity'ater'and'at'elevated'temperaturesA'whe'results'indicated'that' foam'stability'has'an'inverse'relationship'ith'the'amount'of'crude'oilA'Frude'oil'has'a'detrimental'eect'on'foams,'and'foam' stability'decreased'as'the'amount'of'crude'oil'as'increasedA'Depending'on'the'surfactant'type,'the'existence'of'crude'oil'in' porous'media,'even'at'very'lo'concentrations'of'5%'can'signicantly'impact'the'foam'stability'and'strengthA'whe'oil'can'act' as'an'antifoaming'agentA'It'enters'the'thin'aqueous'lm'and'destabilizes'itA'whis'resulted'in'a'loer'foam'viscosity'and'less' 'MRK'dropped'signicantly'in'the'presence'of'higher'oil'fractionsA'whis'study'also'demonstrated' 'foamÂ·'Rapid'prescreeningÂ·'Surfactants

Gas'injection'is'one'of'the'most'promising'techniques'in'enhanced'oil'recovery'(EOR)'processes'(Madathilet'alA')A'Gas'injection'can'aid' in'maximizing'the'oil'recovery'Then'the'injected'gas'becomes'miscible'ith'the'reservoir' of'crude'oil,'and'reducing'its'viscosity'and,'consequently,'enhancing'the'oil'recovery'(Slobod'and'Toch'1953)A'While''injection'has'been' successful'(Hoiland'etalA' of'residual'oil,'the'poor'volumetric'seep'eciency'is'a' lo'viscosity'and'density'compared'to'the'reservoir'uids' Several'methods'have'been'studied'and'tested'to'over-'mobility'challenge'including'ater'alternating'gas'(WCG),'in-situ'foam'generation,'and'using'thickeners'to'increase'the'gas'viscosityA'(Heller'etalA' Chakravarthy 'metalA' the'gas'mobility'challenge 'is'the'in-situ'generation'of'foamA'Foam can help in reducing gas mobility by increasing the apparent viscosity of the gas and reducing its relative per-(Kovscek and Radke 1994; Falls et al.Foam is commonly generated using surfactants ever, one of the challenges of using foam generated by surfactants is its long-term stability.Foam stability at resing water salinity, reservoir temperature, adsorption of surfactant molecules on rock surfaces, degradation of surfactants, and uidâ€"uid interactions (Mannhardt et al.Moreover, the stability of foam oil can act as an antifoaming agent, it enters the thin aque; Manlowe and Radke

). Depending on the surfactant

type, the existence of crude oil in porous media, even at very low concentrations, can signicaly impact the foam of crude oil on foam stability using a custom-made high pressure and high temperature microfluidics system.efits in research and industry across various fields, with foam formulations in the presence of crude oil at a high-Five surfactant solutions test (oil-surfactant solutions) and dynamic foam test (in absence and presence of crude oil) were conducted to perform the comparative assessment among different sur Moreover, the mobility reduction factor-foam was measured in the absence and presence of crude oil at 100 Â°C. Five different surfactants were used in this experimental surfactant (Amphosol CG-50), lauramidopropyl betaine surfactant (Amphosol LB), and cocamidopropyl hydroxysultaine surfactant (Petrostep-SB) used in this study pylenediamine surfactant (Duomeen TTM) both from AkzoNobel (Amsterdam, The Netherlands) were used I Table 1 lists the chemical structure of The synthetic brine used in this study had a total dissolved solid (TDS) content of 57,670 ppm, density of 0.99 g/mL, and viscosity of 0.283 measured The crude oil used had a density of 0.88 g/mL, average viscosity of 3.2 cP measured at 100 Â°C, and the gas used for foam generation was The eect of crude oil on foam stability and strength was studied using dynamic foam tests. of dynamic foam tests were to ensure the foam formation and to evaluate the eect of crude oil on foam stability and conducted to ensure the solutions are stable at experiment tal conditions before conducting the dynamic foam tests. Over twenty surfactants were evaluated, only ve were The shortlisted surfactants are stable in high salinity water at low pH (3.0â€"3.5) and procedure used to prepare solutions, measure the oilâ€"water interfacial tension, conduct two-phase emulsication test, and conduct the dynamic foam tests in absence and pres ence of crude oil. 5 surfactants

are listed as received from the manufacturer Table 1 was dissolved in saline to produce a 0.2 wt. D44 concentration and tested for stability above 100Â°C Surfactant stability was tested at neutral pH It was clear and free of precipitate as shown in Figure 1. No studies have been performed to investigate surfactant degradation. Also, the bottle shake test month to see if bubbles form. Surfactant molecules were still present in solution. Interfacial tension measurement 0.2% by weight of 5 surfactants 0.2% by weight of 5 surfactants Brine solution and crude oil upper phase solution phases were used for interfacial tension measurements. Measurements were taken at 90Â°C to avoid formation.Stabilization of foam in the presence of crude oil.
A list showing the chemical structures of the surfactants used in this study

CG-50 from Lenid Coconut Oil
Surfactant 2Amphosol LB
Surfactant 2Amphosol LB
Surfactant 3PetrostepÂ® SB
Surfactant 4Ethoduomeen T/13
Surfactant 5Duomeen TTM
brine composition timid.

An example shows a picture of a stable solution in saline Surfactant molecules are still present and not broken downTwo-phase emulsification test In measuring the oil effect in the foam test, Changes in foam/oil viscosity can be caused by Competing with damage caused by foam, emulsification, and oilIn field tests, during emulsion formation Foam flooding is undesirable.
Water and oil can be important **.**
On Concrete:
Concrete is one kind of multiphase materials, which the air content of concrete is more than 4%, espe-concrete cross section size, the strength of the con-when the air content of concrete increases 1%, the concrete compressive strength decreases 5% (Older of the air content, the compressive strength decreas- In low strength concrete, the 3-6% air content has no influence on strength, When the air content is more than 6%, the compres- et al, 2008), the bubbles reduced the effective thick- of carbonization of concrete surface, which affects its corrosion resistance, big air bubbles will cause significant effect on the workability, strength and durability of concrete. plication, we always add antifoaming agent to elimi- nate harmful bubbles; there are many different kinds of antifoaming agent, this paper mainly study of four different kinds of antifoaming agent and their influ-ence on concrete. /kg from Huaxin cement factory in china; Fly ash is from Macheng fly ash I (D50 12 m); Slag is from China Construction Ready Mixed Concrete Co. cement and mineral admixture is shown in Table 1.

Table 1 Physical properties of cement and mineral admixture terial R28/MPa28d ratio of compressive strength/�ment 61.5 100.0
The antifoaming agent in our experiment includ-ing mineral oil from Guangzhou bo cheung chemical The Influence of Different Antifoaming Agent on Concrete Department of Technology Center, China State Construction Ready Mixed Concrete CO., LTD, Wuhan,

ABSTRACT: This paper mainly study of four different kinds of antifoaming agent, which can make different influence on the concrete performance and durability.The experimental results show that: According to the comprehensive performance of concrete, the fluidity of concrete with the addition of the polyether modified silicone antifoaming agent is the best, the fresh concrete slump, expansion and the density fluctuates less than another type`s antifoaming agent. Concrete slump loss is also less than another type`s antifoaming agent. comprehensive performance of the concrete added with polyether is also excellent. The silicone oil emulsion type antifoaming agent has a faster bubbles breaking speed, while big fluctuates on the fluidity of concrete

KEYWORD: Antifoaming agent; Mineral oil; Emulsified silicone oil; Polyether;
Polyether modified silicone 4th International Conference on Mechanical Materials and Manufacturing Engineering (MMME 2016)1 2016.
silicone oil is from Yingchuang Degussa (china) In-plasticizers (10% solid content) is from China Construction Ready Mixed Concrete Co. Ltd.The air content of fresh concrete are determined by Construction Materials Standard JC/T601-1995.strength of the concrete are conducted according to antifoaming agent The basic performance indexes of the antifoaming agent is shown in Table 2, including the PH; the content of active matter and the compatibility with of silicone oil emulsion and polycarboxylate super- mineral oil emulsion antifoaming agent added to the
Table 2 The basic performance indexes of the antifoaming agent 3 emulsion emulsified silicone oil 10% 7-9 floatinyether modified silicone12%7-8 Scattered wellEffect of different anti foaming agent on the properties of fresh concrete In this paper, the strength grade of concrete test is C35, concrete mix proportion is shown in table 3, we solid content) as the additive after a lot of experi- ments, the fresh concrete slump and expansion, the density and compressive strength data of concrete is shown in table 4.

Table 3 concrete mix proportion
proportionwater cement fly Table4 The workability and compressive strength of concrete 3 emulsified silicone oil 0.05 210/550180/490 Serial Type Dosage(g) Serial Type Dosage(g) 1 mineral oil 0.05 2350 2410 28.1 37.3 1 mineral oil 0.05 2350 2410 28.1 37.3 3 Emulsify-ied silicone oil 4 Polyeth-er modifie-d silicone 4 Polyeth-er modifie-d silicone According to the comprehensive performance of concrete, the fluidity

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