Synthesis and antibacterial activity of 4, 6- Di (methyl-β-thiourea) -m-xylene

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Abstract:
4,6- Di (methyl-β-thiourea) -m-xylene (2) have been synthesized from reaction of 4,6- Di (chloro methyl) -m-xylene (1) with thiourea solution / isopropanol and tested for antibacterial activity against type of bacteria which causes microbiological corrosion in pipes lines which used in petroleum wells , 4,6- Di (methyl-β-thiourea) -m-xylene (2) is a new compound . exhibited higher bacterial effects than other prepared compounds .

الخلاصة:
حضر المركب 6,4- ثنائي (مثيل- بيتا- ثايوريا)- ميتا- زايلين (2) من تفاعل 6,4-ثنائي(كلورومثيل)- ميتا-زايلين (1) مع محلول الثايوريا بوجود الايزوبروبانول واختبرت فعاليته البايولوجية بوصفه مضاد لنوع من البكتيريا (البكتيريا المختزلة للكبريتات) التي تسبب تاكل مايكروبايولوجي في خطوط الانابيب المستخدمة داخل ابار النفط.
المركب 6,4- ثنائي (مثيل - بيتا- ثايوريا)- ميتا- زايلين (2) اظهر فعالية عالية ضد بكتيريا النفط بالمقارنة مع مركبات اخرى مستعملة لهذا الغرض بالاضافة الى كونه يحضر لاول مرة.

Introduction:

In order to get oil and gas from petroleum wells , many machines and pipes lines are needed , many problems exist due to hydrogen sulphide (H_2S) which is formed due to biological reduction for sulphate in petroleum wells , hydrogen sulphide gas causes some problems such as , reduction of pipes lines stability , corrosion of machines , poisoning of workers , polluting of environment , fires , and explosions .[1-4]

Some types of anaerobic bacteria have an effect on the corrosion process (microbiological corrosion) due to liberation of H_2S gas from reduction the sulphate to sulphur, then to H_2S which is converted to ferrous sulphide (FeS).[5]

Microbiological corrosion represents 10% of the other types of corrosion, due to microbiology which play a large role in corrosion process in oil industries especially that exist underground, such as machines, and pipes lines (water, oil, and gas).[6]

One of the methods that are considers more active towards these bacteria is using chemical materials for removing or killing these bacteria.

Highest concentration for these chemical materials should kill no less than 99% of these bacteria. This activity depends on structures and components of chemical materials which are used.[7]

Experimental:

Materials and methods:

Melting point is uncorrected and was taken in open capillary on Gallen- kamp apparatus. Infrared spectra were determined in KBr on Perkin Elmer model – 137 infracord.Elemental analyses (C, H, and S) were carried out with a Coleman analyzer. The experiments were identified by the state academy for oil and gas Baku / Azerbaijan.

Test for bacterial activity:

The experiments were identified by the state academy for oil and gas Baku / Azerbaijan.

Synthesis of compound:

4, 6- Di (methyl-β-thiourea) -m-xylene (2) [8]

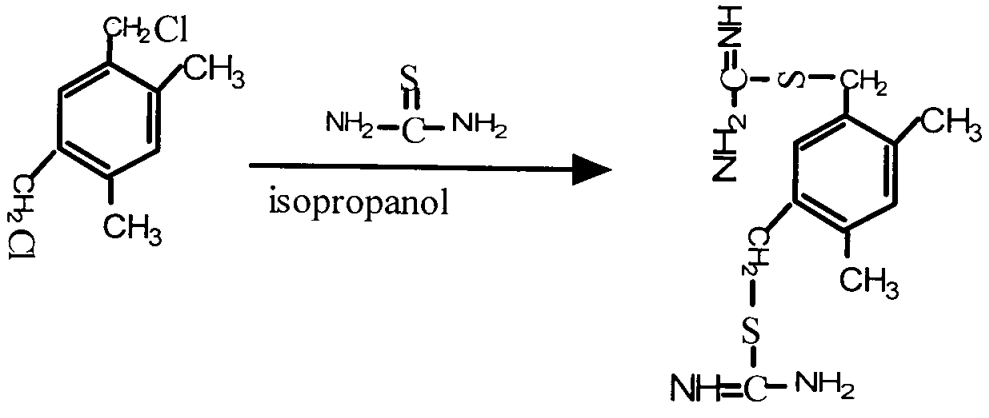
To a mixture of 4,6- Di (chloro methyl) -m-xylene (1) (40.6 gm , 0.2 mol) in isopropanol (140 ml) is added a solution of thiourea (38 gm,0.5 mol) in distilled water (60 ml) .The reaction mixture was heated under reflux with stirring for 30 min. then it was cooled. The solid product was filtered , washed with water , recrystelization with ethanol and dried to give pale yellow crystals , yield (34.5 gm), (0.122 mol,85%), M.P: 220-221 C°.

Results and discussion:

Reaction of 4,6- Di (chloro methyl) -m-xylene (1) with solution / isopropanol under reflux gave 4, 6- Di (methyl-β-thiourea) -m-xylene (2) ,this product was identified by I.R spectra which showed bands at 3300-3400 cm $^{-1}$ and 1380-1290 cm $^{-1}$ to (-NH_2) ,and(N-CS-N) groups respectively ,and band at 1200 cm $^{-1}$ which is assigned to the Cl group has disappeared .Analysis for **$C_{12}H_{18}N_4S_2$ (282)**

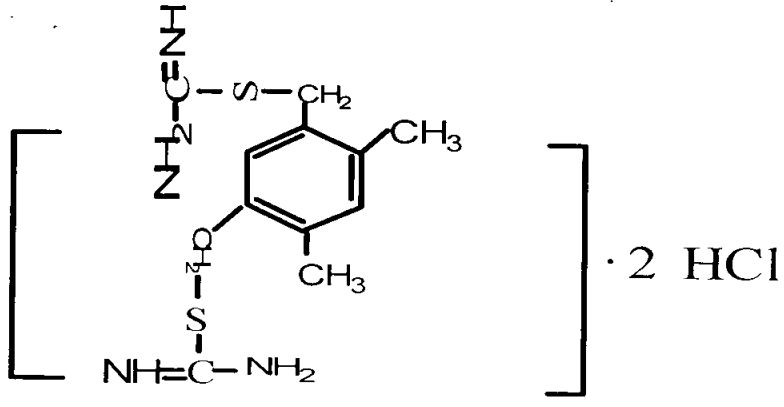
Calc. : C, 51.06; H, 6.38; S, 22.69

Found: C, 50.95; H, 6.24; S, 22.57

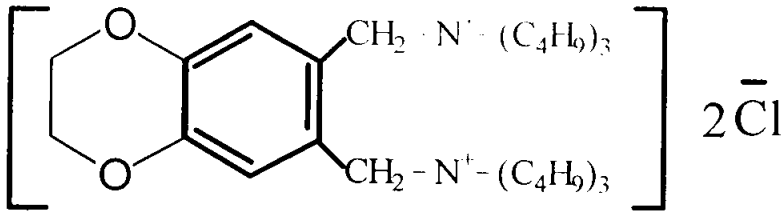


[1] [2]

The results in table (1) show that the new compound (2) has higher bacterial activity than compound (3), which is used in the state academy for oil and gas Baku – Azerbaijan. Thiourea salt (2) gave 99% protection from corrosion at concentration 75% and corrosion rate 0.047, while compound (3) did not give this percentage at concentration 100%. This biological activity makes compound (2) more useful economically.



[2]



[3]

compound	Conc. mg/lit.	Bacteria kill degree %	Protection %	Corrosion rate gm/m^2
2	10	80	85	0.71
	25	90	96.5	0.17
	50	100	99	0.05
	75	**100**	**99**	**0.047**
	100	100	99	0.04
3	10	40	72.5	1.31
	25	60	82.5	0.83
	50	80	90	0.475
	75	90	93.5	0.31
	100	**100**	**95**	**0.24**

Table 1: results show the comparison between compound (2) and compound (3) obtained from the state academy for oil and gas Baku – Azerbaijan.

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