
AB
GRAD
CON23

1
00:00:14,690 --> 00:00:10,870
[Music]

2
00:00:17,750 --> 00:00:14,700
Hello I'm from Honda I'm a PhD student

3
00:00:20,050 --> 00:00:17,760
from University of Sao Paulo in Brazil

4
00:00:22,790 --> 00:00:20,060
and I'll talk about my work

5
00:00:25,450 --> 00:00:22,800
microbial mediated carbon mineralization

6
00:00:29,089 --> 00:00:25,460
from agove Brazil

7
00:00:31,790 --> 00:00:29,099
so uh the motivation for this works the

8
00:00:33,830 --> 00:00:31,800
importance of studying the evolution of

9
00:00:36,410 --> 00:00:33,840
life on Earth as we know that the first

10
00:00:39,889 --> 00:00:36,420
signs of Life are eliminations and

11
00:00:41,750 --> 00:00:39,899
fossils of microorganisms and within

12
00:00:43,850 --> 00:00:41,760
this we have the investigation of

13
00:00:46,430 --> 00:00:43,860

potential evidence of life such as

14
00:00:48,350 --> 00:00:46,440
microbial forces and stromatolites then

15
00:00:50,529 --> 00:00:48,360
we need to differentiate from my medic

16
00:00:53,810 --> 00:00:50,539
form of an

17
00:00:56,270 --> 00:00:53,820
inorganic mineral so therefore it's

18
00:00:58,569 --> 00:00:56,280
necessary to investigate the biogenicity

19
00:01:02,270 --> 00:00:58,579
that is that if if that was actually

20
00:01:04,130 --> 00:01:02,280
formed by life or not and also we have

21
00:01:06,590 --> 00:01:04,140
the Dolomite problem that is a major

22
00:01:11,710 --> 00:01:06,600
question the scientists have been

23
00:01:16,730 --> 00:01:14,510
are one of the most important records of

24
00:01:18,530 --> 00:01:16,740
from the past and even if with the

25
00:01:21,289 --> 00:01:18,540
several studies related to development

26
00:01:24,469 --> 00:01:21,299
formation uh the results are still

27
00:01:27,890 --> 00:01:24,479
controversial maybe to the the little

28
00:01:30,350 --> 00:01:27,900
understanding uh that exists and the

29
00:01:33,410 --> 00:01:30,360
difficulty of obtaining this mineral in

30
00:01:36,109 --> 00:01:33,420
laboratory conditions like uh below 50

31
00:01:38,749 --> 00:01:36,119
degrees Celsius so given this we have

32
00:01:41,690 --> 00:01:38,759
the so-called Dolomite problem uh which

33
00:01:44,149 --> 00:01:41,700
has been much debated over uh the last

34
00:01:46,010 --> 00:01:44,159
few years however it is possible to find

35
00:01:48,950 --> 00:01:46,020
a few current dollar my precipitation

36
00:01:50,929 --> 00:01:48,960
events in hyper saline lakes and

37
00:01:53,450 --> 00:01:50,939
alkaline environments such as this

38
00:01:56,350 --> 00:01:53,460

region of Lago of Emira and but I should

39
00:01:58,010 --> 00:01:56,360
do this thing that is next to each other

40
00:02:01,130 --> 00:01:58,020
and

41
00:02:02,149 --> 00:02:01,140
um so these are one of the few places in

42
00:02:05,510 --> 00:02:02,159
the world that has Dolomite

43
00:02:07,010 --> 00:02:05,520
precipitation uh today so in these

44
00:02:09,350 --> 00:02:07,020
places there are microorganisms

45
00:02:11,570 --> 00:02:09,360
responsible for mediating the Carbonite

46
00:02:13,550 --> 00:02:11,580
precipitation uh which can serve as a

47
00:02:17,110 --> 00:02:13,560
nucleation centers for for the mineral

48
00:02:20,270 --> 00:02:17,120
uh within their biofilm their EPS

49
00:02:23,089 --> 00:02:20,280
exopolymeric extracellular substance

50
00:02:26,809 --> 00:02:23,099
and this photo was taken during my field

51
00:02:29,750 --> 00:02:26,819
collection and it shows their uh a thick

52
00:02:33,350 --> 00:02:29,760
layer of of dolomite of dolomite

53
00:02:36,830 --> 00:02:33,360
sediment below and uh above we can see

54
00:02:38,510 --> 00:02:36,840
like a microbial match with a biofilm in

55
00:02:43,190 --> 00:02:38,520
the

56
00:02:45,890 --> 00:02:43,200
so talking briefly about right

57
00:02:48,710 --> 00:02:45,900
precipitation by microorganisms in

58
00:02:50,949 --> 00:02:48,720
nature environmental conditions modulate

59
00:02:53,570 --> 00:02:50,959
the communities and within that a lot of

60
00:02:56,809 --> 00:02:53,580
microorganisms uh they are known for

61
00:02:58,490 --> 00:02:56,819
their ability to precipitate minerals so

62
00:03:01,250 --> 00:02:58,500
these minerals can be precipitated by

63
00:03:04,309 --> 00:03:01,260

physical methods in which the microbial

64
00:03:06,710 --> 00:03:04,319
Community serves as a nucleation of a

65
00:03:10,250 --> 00:03:06,720
nucleation site for the deformation of

66
00:03:12,790 --> 00:03:10,260
carbonate or it can be in a chemical way

67
00:03:15,589 --> 00:03:12,800
or an inorganic as an inorganic mineral

68
00:03:17,930 --> 00:03:15,599
so this precipitation occurs mainly due

69
00:03:20,210 --> 00:03:17,940
to changes in the pH the amount of

70
00:03:22,449 --> 00:03:20,220
organic carbon dissolves in the medium

71
00:03:25,309 --> 00:03:22,459
or the environment

72
00:03:27,350 --> 00:03:25,319
and the availability of calcium and

73
00:03:29,570 --> 00:03:27,360
magnesium ions so in the case of

74
00:03:33,890 --> 00:03:29,580
dolomite and the availability of

75
00:03:36,410 --> 00:03:33,900
nucleation sites for Crystal formation

76
00:03:39,290 --> 00:03:36,420
that can be the exopolymeric substances

77
00:03:40,490 --> 00:03:39,300
present in the in the biofilms of

78
00:03:41,270 --> 00:03:40,500
bacteria

79
00:03:43,970 --> 00:03:41,280
thank you

80
00:03:46,490 --> 00:03:43,980
so some microorganisms have the ability

81
00:03:48,949 --> 00:03:46,500
to produce biofumes formed by these

82
00:03:51,309 --> 00:03:48,959
these extracellular polymeric substances

83
00:03:54,710 --> 00:03:51,319
which are mainly composed of

84
00:03:57,530 --> 00:03:54,720
exopolysaccharides acidic residues uh

85
00:03:59,750 --> 00:03:57,540
sugars they have a negative charge and

86
00:04:03,289 --> 00:03:59,760
and can bind to different ions such as

87
00:04:05,330 --> 00:04:03,299
calcium magnesium so the role of DPS in

88
00:04:10,210 --> 00:04:05,340

the precipitation of carbonate occurs in

89
00:04:12,770 --> 00:04:10,220
two fronts initially the EPS can reduce

90
00:04:15,710 --> 00:04:12,780
precipitation by sequestering metallic

91
00:04:21,170 --> 00:04:15,720
ions but during the degradation of the

92
00:04:23,629 --> 00:04:21,180
EPS by some sulfur reducing bacteria uh

93
00:04:26,510 --> 00:04:23,639
the resulting High concentration of of

94
00:04:28,909 --> 00:04:26,520
calcium calcium magnesium ions can favor

95
00:04:31,909 --> 00:04:28,919
precipitation and in addition The

96
00:04:33,950 --> 00:04:31,919
Continuous supply of ions added to a

97
00:04:37,610 --> 00:04:33,960
more alkaline environment due to micro

98
00:04:40,189 --> 00:04:37,620
the micro environmental generated micro

99
00:04:42,770 --> 00:04:40,199
environment generated by the EPS May

100
00:04:44,150 --> 00:04:42,780
favor the bioprecipitation of of these

101
00:04:46,550 --> 00:04:44,160
minerals

102
00:04:49,189 --> 00:04:46,560
so now moving to the Azure biological

103
00:04:51,770 --> 00:04:49,199
importance it's interesting to know that

104
00:04:54,850 --> 00:04:51,780
the environmental condition of Mars in

105
00:04:58,129 --> 00:04:54,860
the nwakian Hesperian period

106
00:05:01,129 --> 00:04:58,139
why similar to why similar to work so at

107
00:05:04,610 --> 00:05:01,139
that time it was a much it has it had a

108
00:05:07,010 --> 00:05:04,620
much denser atmosphere a higher

109
00:05:09,590 --> 00:05:07,020
temperatures than the possible presence

110
00:05:11,870 --> 00:05:09,600
of liquid water on the surface which

111
00:05:14,050 --> 00:05:11,880
indicates the potential of of the planet

112
00:05:16,909 --> 00:05:14,060
to have supported microbial life

113
00:05:20,090 --> 00:05:16,919

so in the face of this some geological

114
00:05:22,010 --> 00:05:20,100
studies of g0 crater on Mars have

115
00:05:24,650 --> 00:05:22,020
demonstrated a large carbonate deposits

116
00:05:27,110 --> 00:05:24,660
in the west region of the crater and on

117
00:05:28,790 --> 00:05:27,120
on Earth regions of hypersonic shallow

118
00:05:31,129 --> 00:05:28,800
Lakes are closely related to the

119
00:05:33,129 --> 00:05:31,139
biological deposition of carbonates

120
00:05:36,590 --> 00:05:33,139
indicating great potential for

121
00:05:39,230 --> 00:05:36,600
identifier identifying preserved by a

122
00:05:44,150 --> 00:05:39,240
signature in these regions

123
00:05:45,230 --> 00:05:44,160
uh so I I would just specifically uh for

124
00:05:47,390 --> 00:05:45,240
a

125
00:05:50,810 --> 00:05:47,400
through these objectives so my

126
00:05:52,790 --> 00:05:50,820
objectives are testing a Carbonite

127
00:05:54,830 --> 00:05:52,800
mineral precipitation using allophiedic

128
00:05:57,650 --> 00:05:54,840
bacteria from Lego Batman

129
00:05:59,330 --> 00:05:57,660
and uh do structural morphological and

130
00:06:02,469 --> 00:05:59,340
optic investigation of Carbonite

131
00:06:06,290 --> 00:06:02,479
minerals like x-ray diffraction remain

132
00:06:07,010 --> 00:06:06,300
spectroscopy synchrosomite techniques

133
00:06:09,890 --> 00:06:07,020
um

134
00:06:11,510 --> 00:06:09,900
and uh they're established by viable

135
00:06:13,430 --> 00:06:11,520
protocols for biosignature

136
00:06:17,330 --> 00:06:13,440
identification

137
00:06:19,610 --> 00:06:17,340
so uh briefly uh you can see more in my

138
00:06:23,029 --> 00:06:19,620

poster for the precipitation experiment

139
00:06:25,430 --> 00:06:23,039
the methodology of montanale uh that is

140
00:06:28,249 --> 00:06:25,440
a reference that studies this uh this

141
00:06:30,830 --> 00:06:28,259
region was used to test if metabolically

142
00:06:33,110 --> 00:06:30,840
inactivated cells within biofilm could

143
00:06:35,390 --> 00:06:33,120
precipitate minerals only with the

144
00:06:37,550 --> 00:06:35,400
biofilm so the experiment was carried

145
00:06:39,710 --> 00:06:37,560
out in a controlled environment at 30

146
00:06:43,309 --> 00:06:39,720
degrees and was divided into these

147
00:06:46,370 --> 00:06:43,319
conditions that we had a DPS treatment

148
00:06:49,670 --> 00:06:46,380
that we let the bacteria growing for 15

149
00:06:51,770 --> 00:06:49,680
days then we added the antibiotics to

150
00:06:54,770 --> 00:06:51,780
inactivate the cells with the biofin

151
00:06:57,790 --> 00:06:54,780
form then we had the bacteria growing

152
00:07:00,529 --> 00:06:57,800
normally then we had a treatment with

153
00:07:02,330 --> 00:07:00,539
antibiotics being added from the

154
00:07:05,510 --> 00:07:02,340
beginning and we had the control without

155
00:07:08,390 --> 00:07:05,520
victory so we did this experiment to

156
00:07:10,189 --> 00:07:08,400
test if this was possible to form uh

157
00:07:14,629 --> 00:07:10,199
precipitates only with the biofilm but

158
00:07:17,749 --> 00:07:14,639
we said we said we saw that uh it's uh

159
00:07:21,110 --> 00:07:17,759
we we've we found a viable sales after

160
00:07:23,870 --> 00:07:21,120
after some time of of experiment uh

161
00:07:26,089 --> 00:07:23,880
within this biofilm so I think that it's

162
00:07:29,469 --> 00:07:26,099
really hard to inactivate cells in this

163
00:07:32,689 --> 00:07:29,479

way so we are trying other protocols and

164
00:07:35,330 --> 00:07:32,699
uh here here is only my preliminary

165
00:07:38,390 --> 00:07:35,340
results just giving a brief about this

166
00:07:40,430 --> 00:07:38,400
oh I'll talk to my poster after

167
00:07:42,409 --> 00:07:40,440
obtaining these precipitates we analyze

168
00:07:44,510 --> 00:07:42,419
the X-ray diffraction to identify the

169
00:07:46,670 --> 00:07:44,520
mineral phases present in the sample of

170
00:07:49,490 --> 00:07:46,680
the bacteria idiomarina the string

171
00:07:51,850 --> 00:07:49,500
called uh here in the right we took a

172
00:07:55,129 --> 00:07:51,860
scanning electron microscopy

173
00:07:56,809 --> 00:07:55,139
of the the precipitates from the same

174
00:07:59,570 --> 00:07:56,819
bacteria and we can see the difference

175
00:08:02,150 --> 00:07:59,580
different morphologies such as dumbbells

176
00:08:04,550 --> 00:08:02,160
shapes and rounded shapes of calcium

177
00:08:06,589 --> 00:08:04,560
carbonates and this morphology are

178
00:08:09,830 --> 00:08:06,599
usually associated with biogenic

179
00:08:12,230 --> 00:08:09,840
minerals so we still need to analyze EDS

180
00:08:14,809 --> 00:08:12,240
spectrums for a conform conform more

181
00:08:17,870 --> 00:08:14,819
exactly which mineral each morphology

182
00:08:19,850 --> 00:08:17,880
relates to and finding my minor shifts

183
00:08:22,730 --> 00:08:19,860
in the the fraterograms and the the

184
00:08:25,390 --> 00:08:22,740
Raman spectrums for establishing viable

185
00:08:31,280 --> 00:08:25,400
protocols so this is my poster session

186
00:08:34,960 --> 00:08:31,290
uh 22 and that's it thank you so much