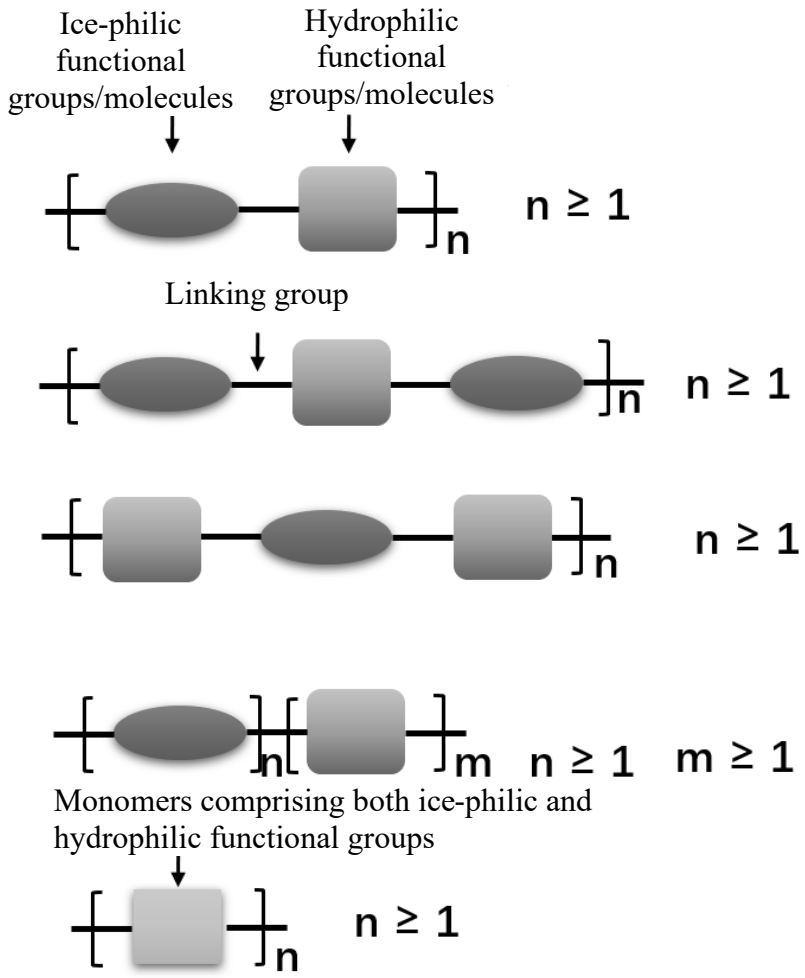

Ice-philic functional groups/molecules
Hydrophilic functional groups/molecules
n ≥ 1
n
Linking group
n ≥ 1
n
n ≥ 1
n
n
m
n ≥ 1
m ≥ 1
Monomers comprising both ice-philic and hydrophilic functional groups
n ≥ 1
n

FIG. 1

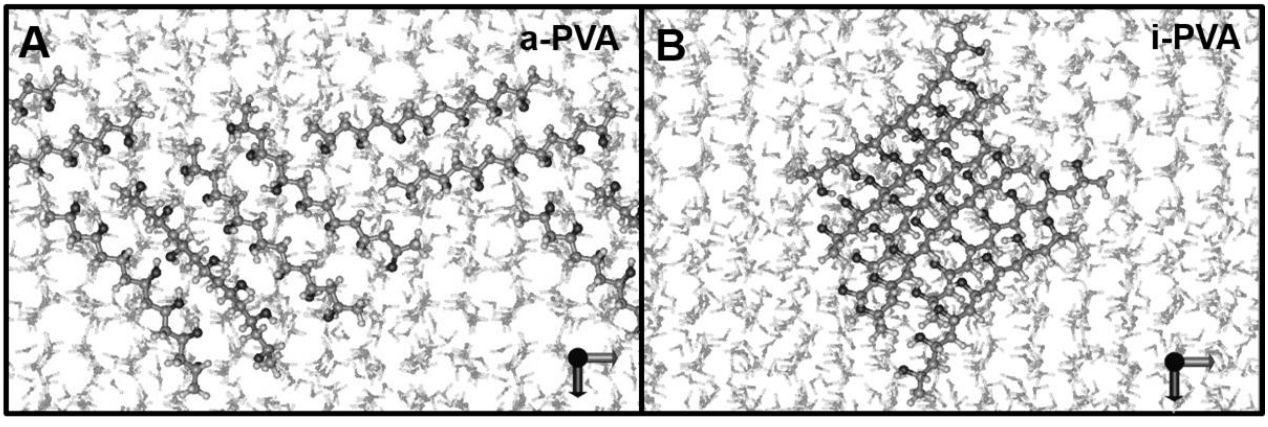

A
a-PVA
B
i-PVA

FIG. 2

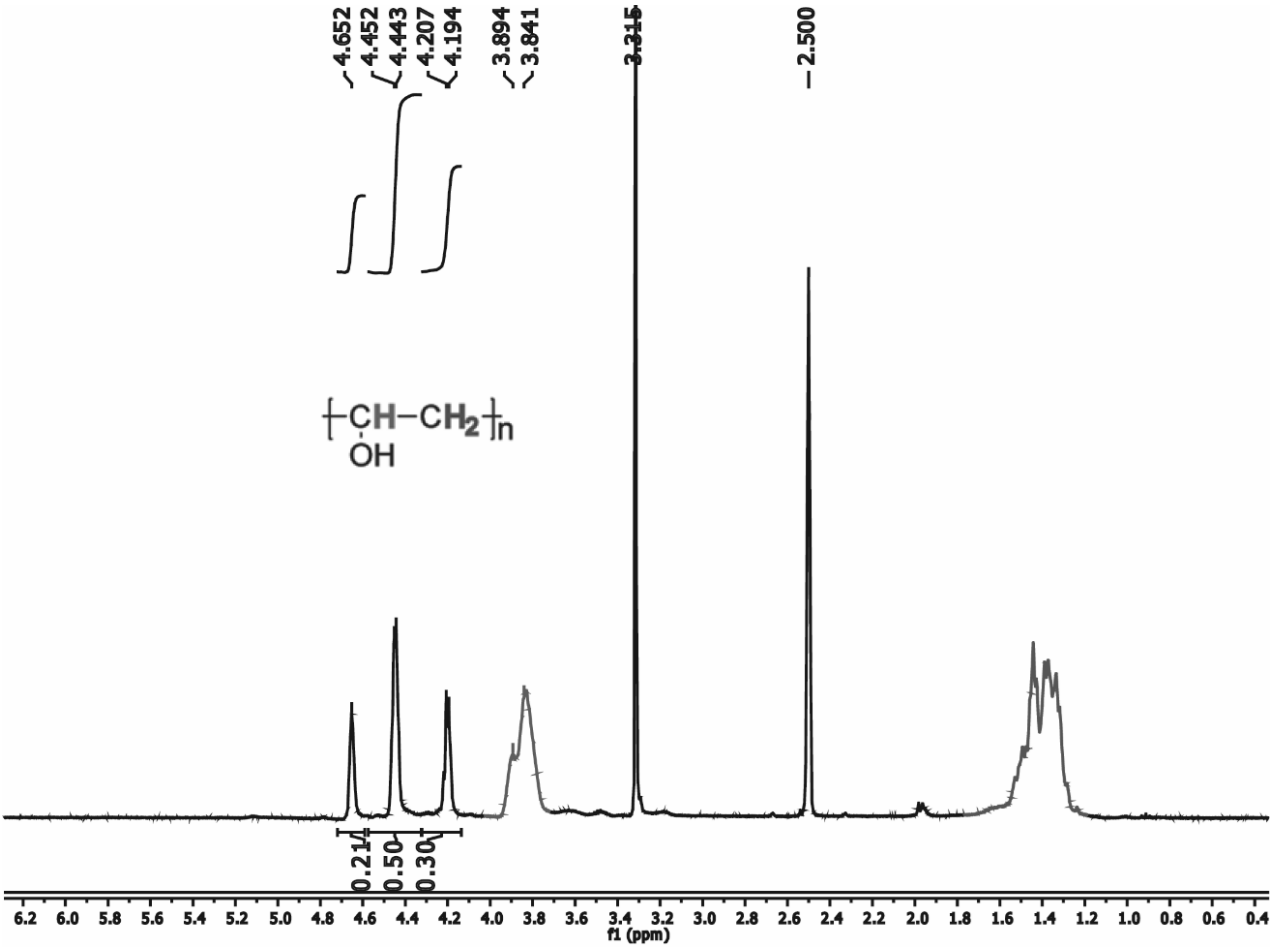

4.652
4.452
4.443
4.207
4.194
3.894
3.841
3.315
2.500
0.21
0.50
0.30
f1 (ppm)

FIG. 3

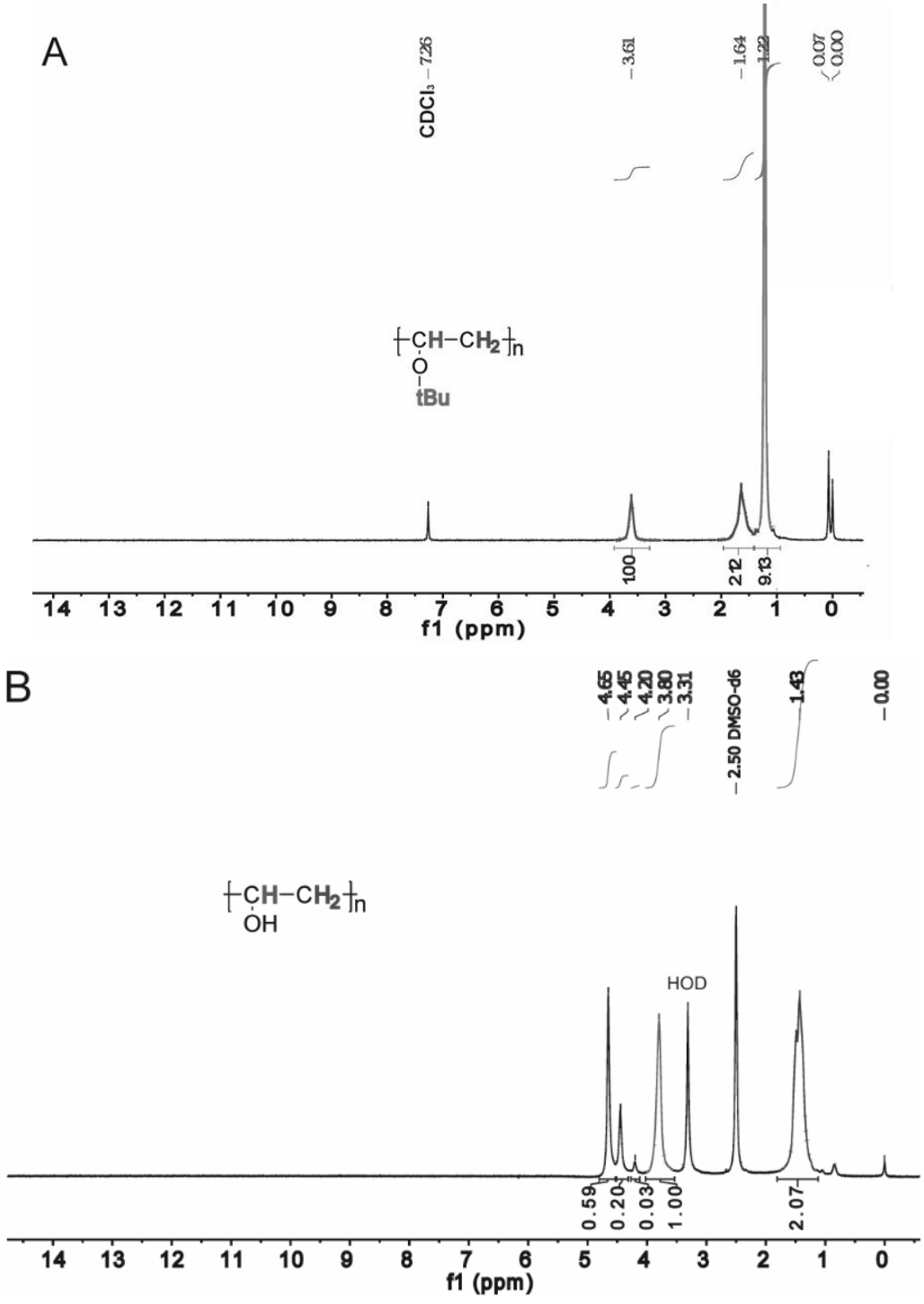

A
CDCl3 – 7.26
3.61
1.64
1.23
0.07
0.00
tBu
100
2.12
9.13
f1 (ppm)
B
4.65
4.45
4.20
3.80
3.31
2.50 DMSO-d6
1.43
0.00
OH
HOD
0.59
0.20
0.03
1.00
2.07
f1 (ppm)

FIG. 4

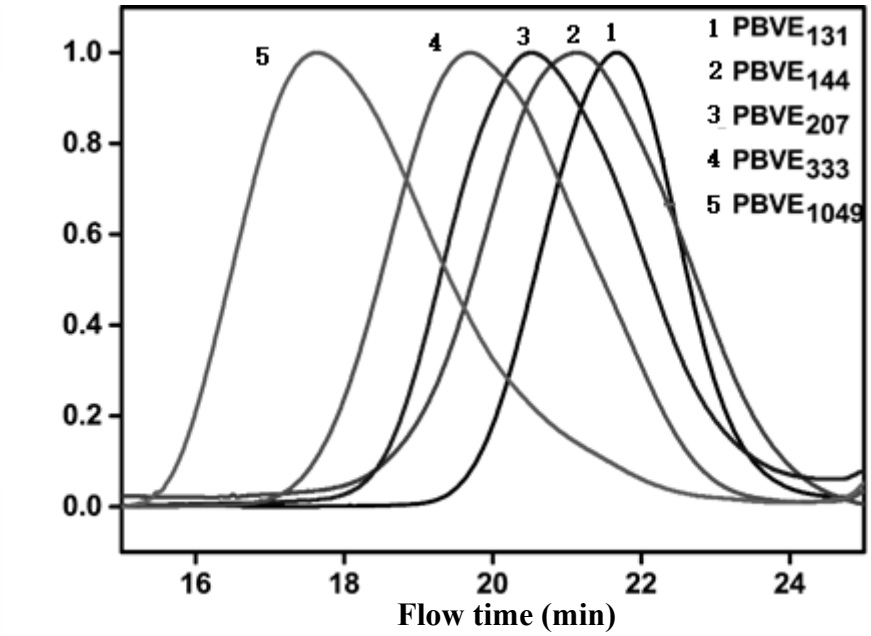


FIG. 5

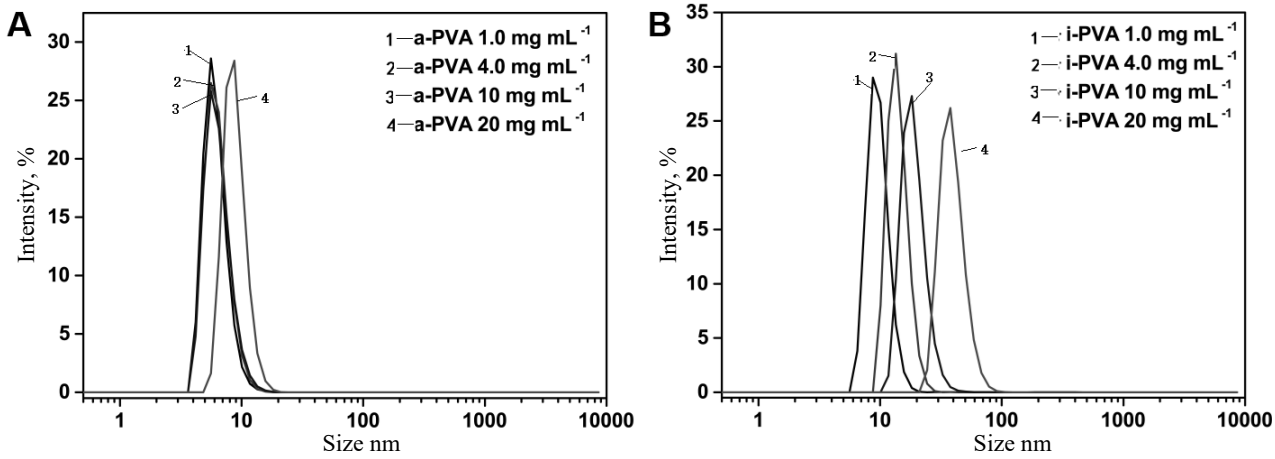


FIG. 6

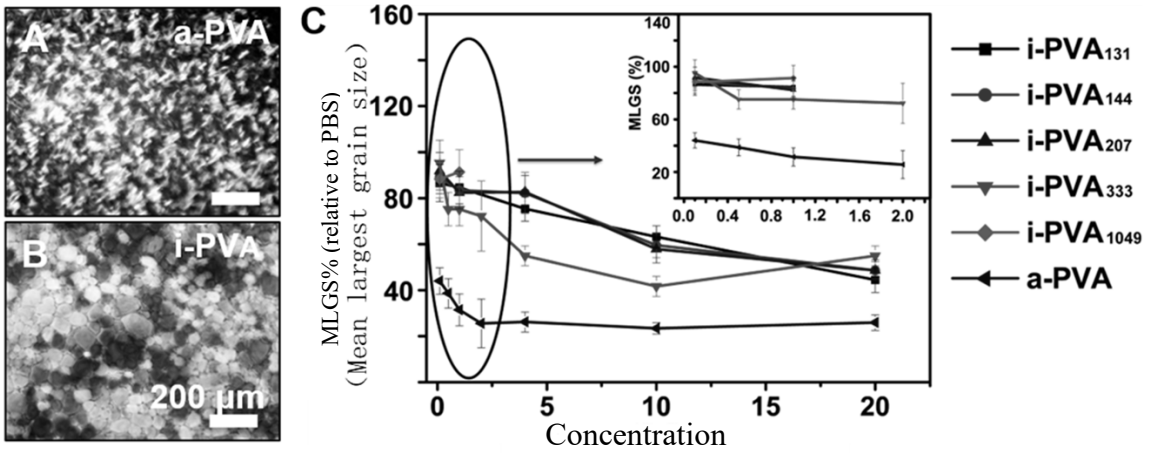


FIG. 7

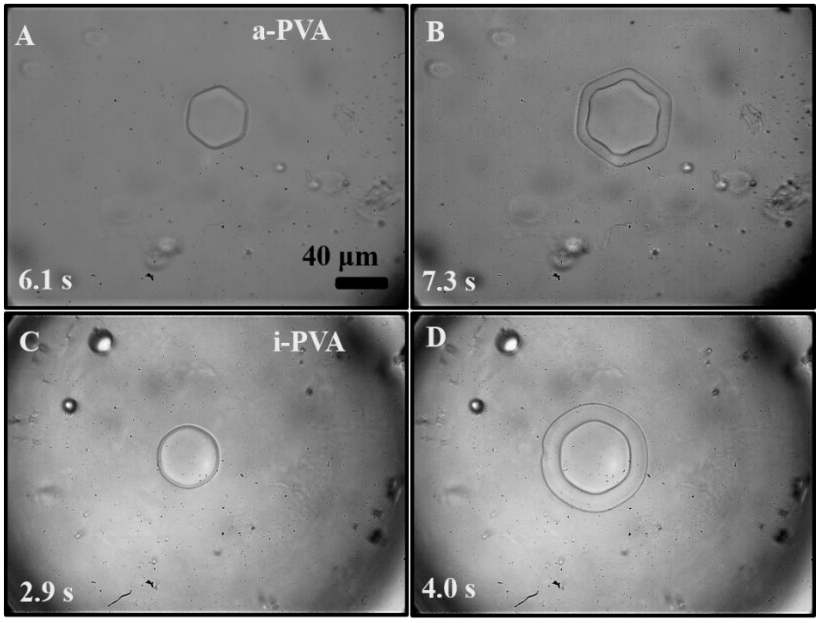
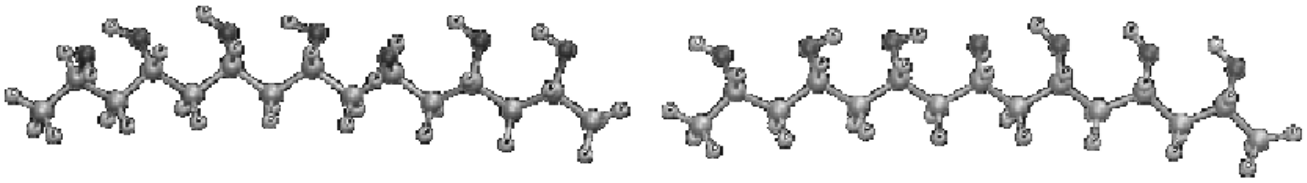


FIG. 8



Atactic PVA (a-PVA) **Isotactic PVA (i-PVA)**

FIG. 9

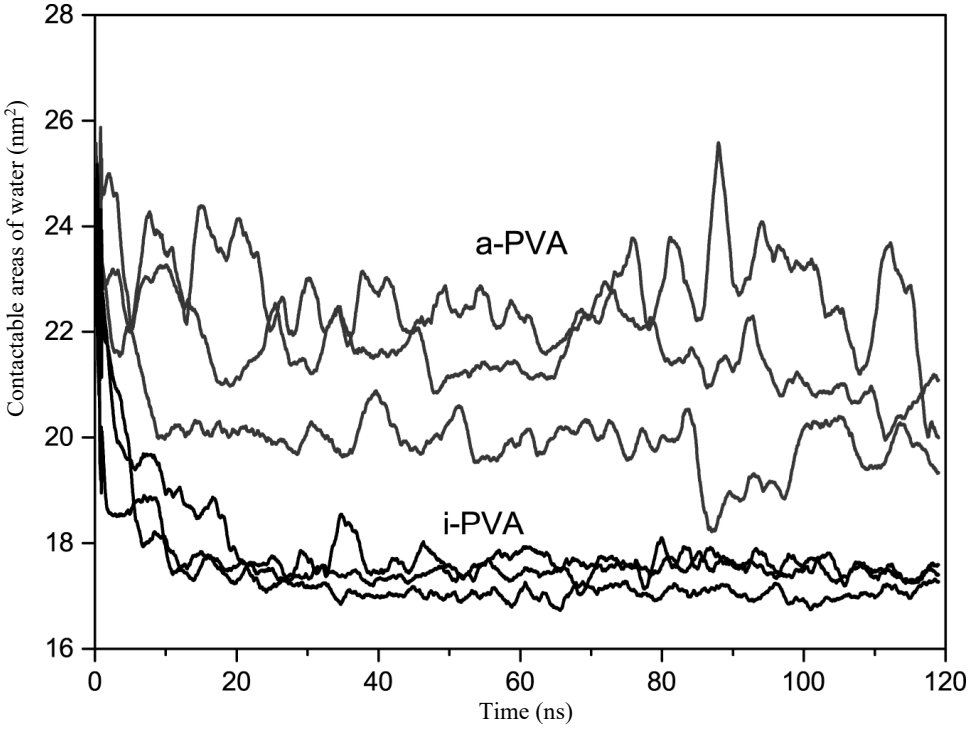


FIG. 10

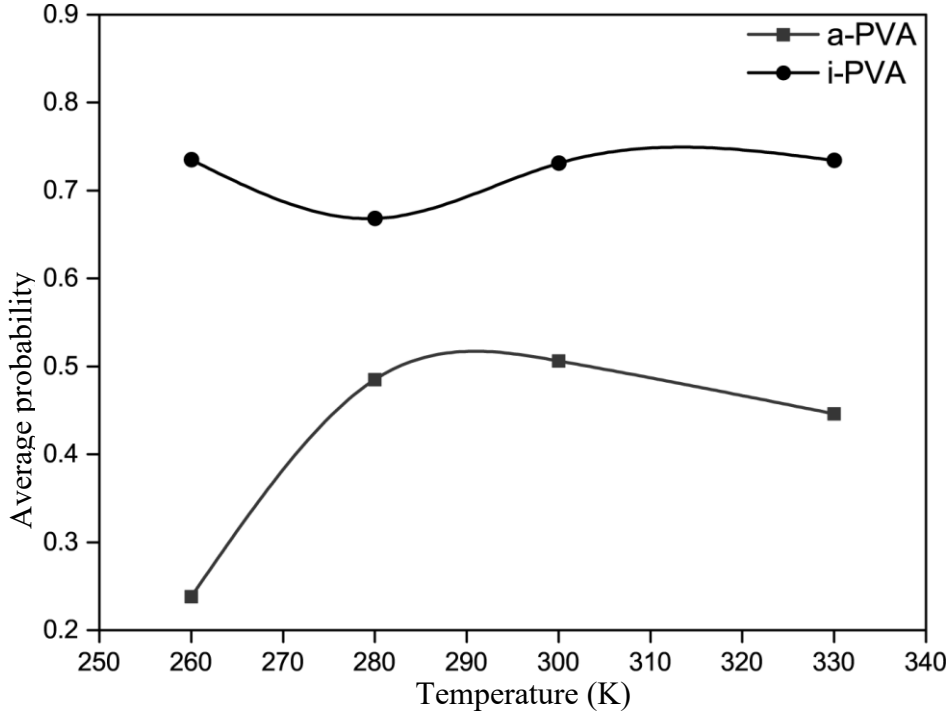

a-PVA
i-PVA
Average probability
Temperature (K)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
250
260
270
280
290
300
310
320
330
340

FIG. 11

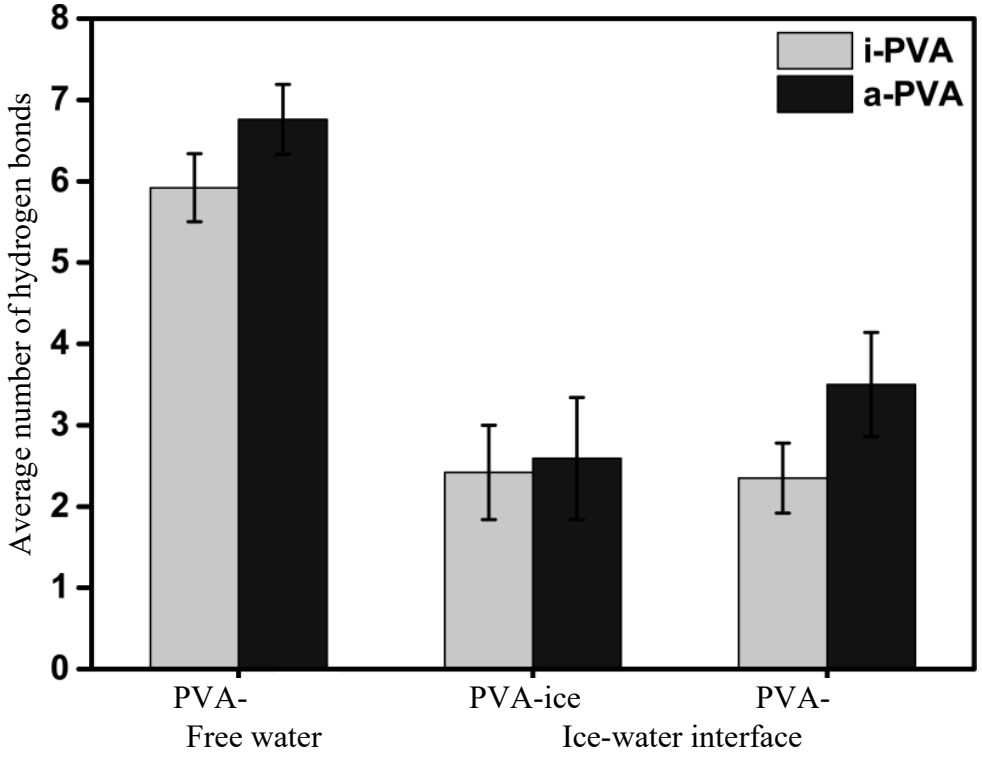

i-PVA
a-PVA
Average number of hydrogen bonds
PVA-
Free water
PVA-ice
PVA-
Ice-water interface
0
1
2
3
4
5
6
7
8

FIG. 12

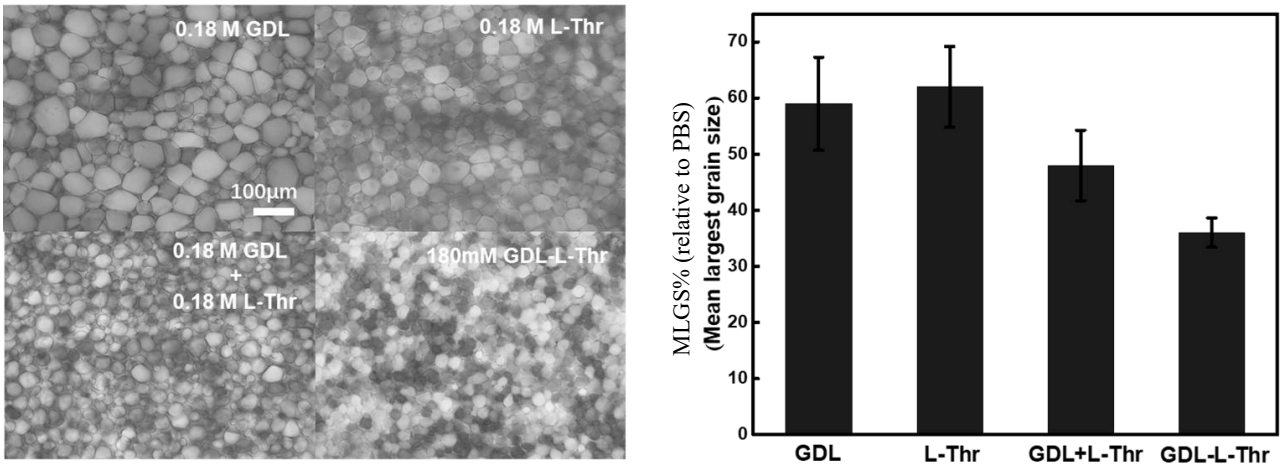


FIG. 13

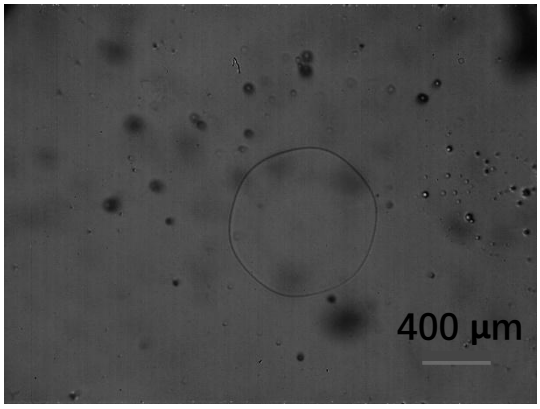


FIG. 14

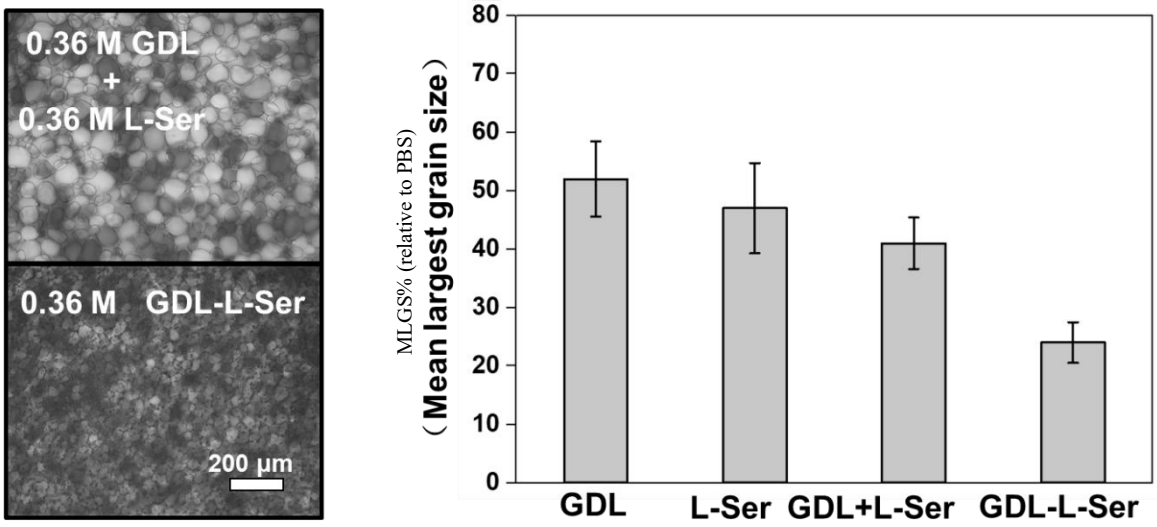


FIG. 15

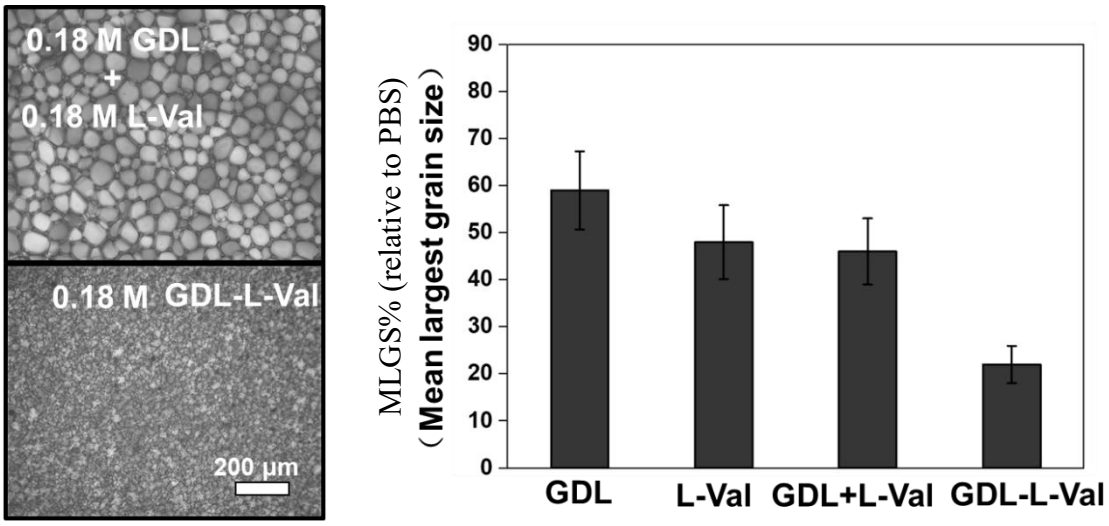


FIG. 16

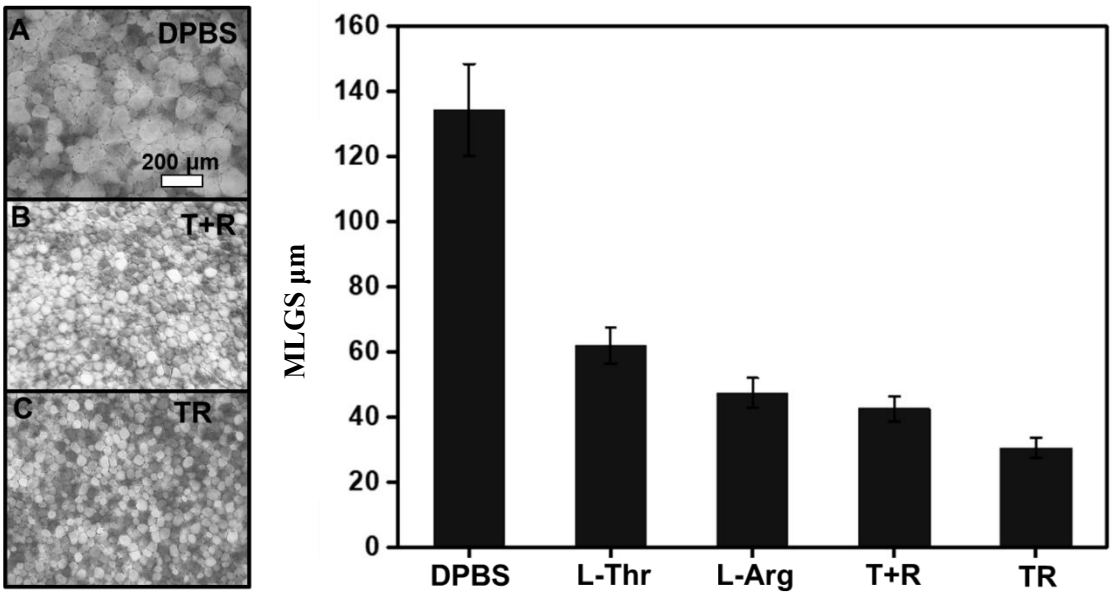


FIG. 17

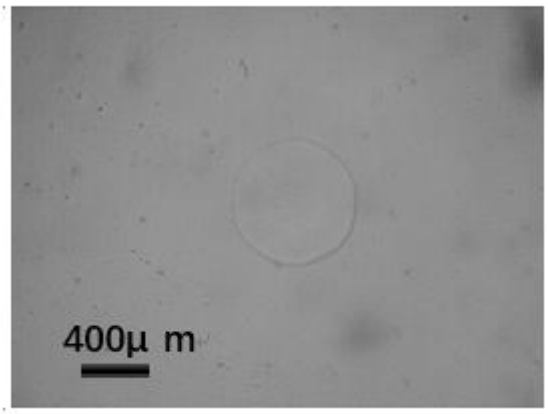


FIG. 18

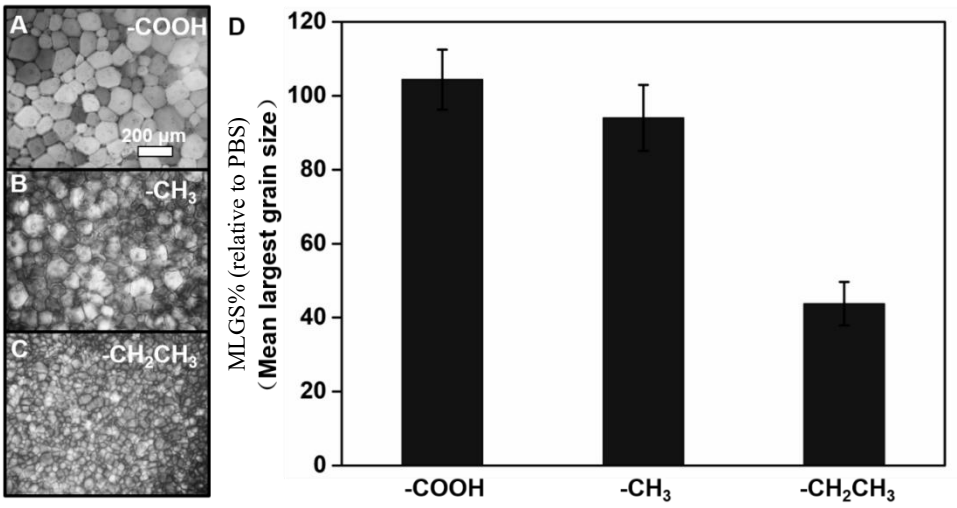


FIG. 19

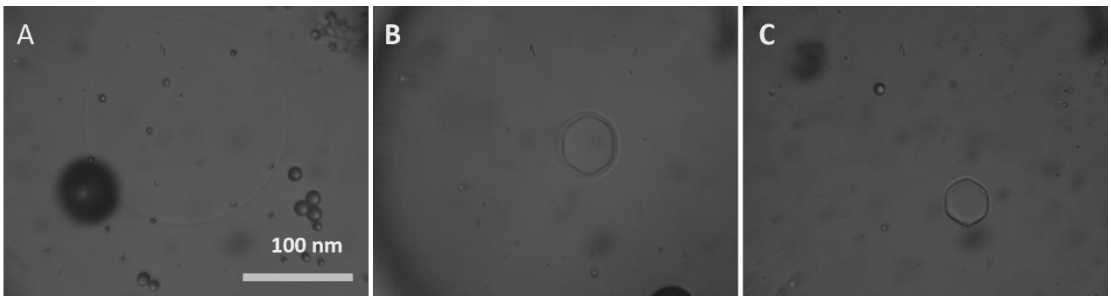


FIG. 20

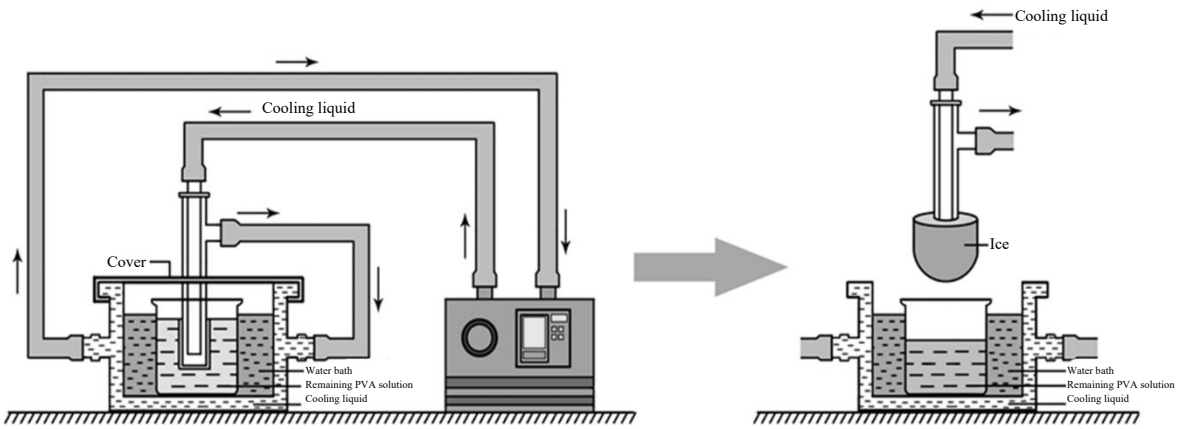


FIG. 21

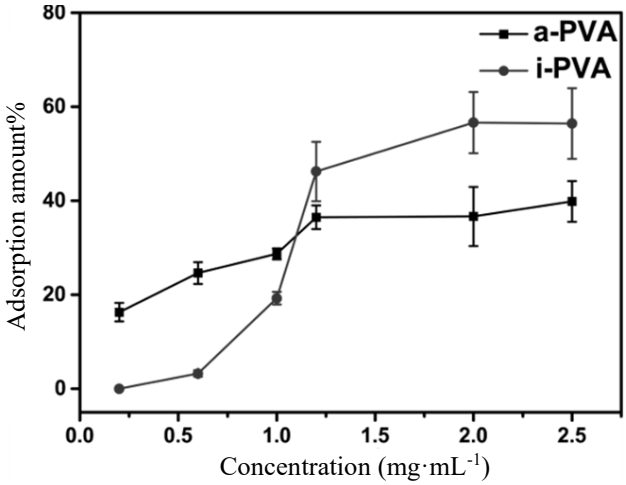


FIG. 22

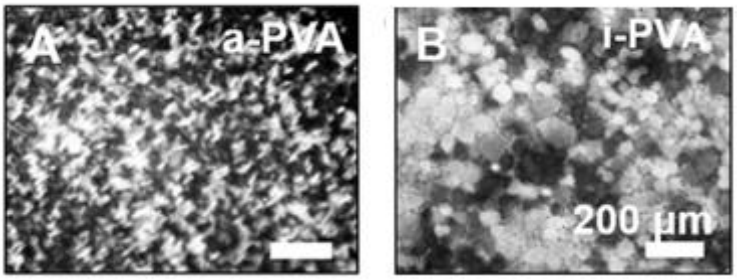


FIG. 23

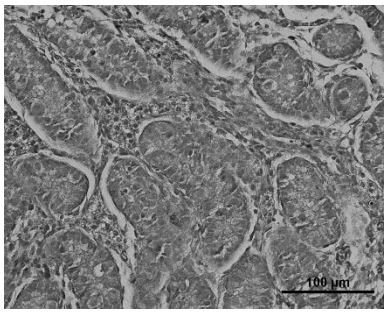


FIG. 24

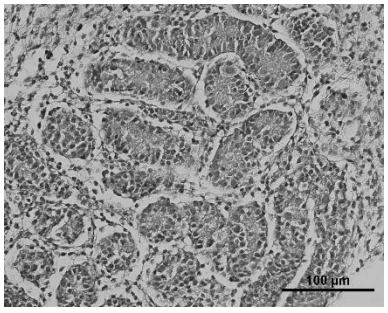


FIG. 25

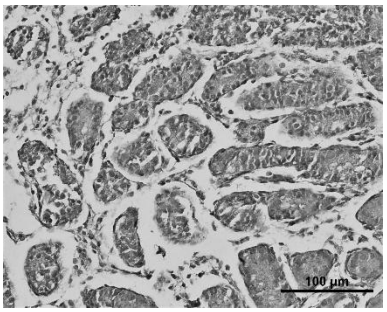


FIG. 26

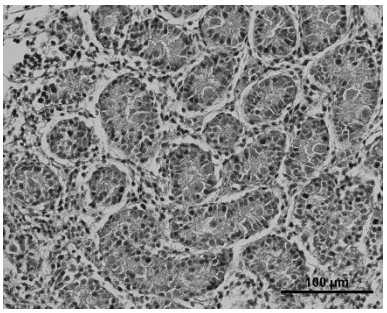


FIG. 27

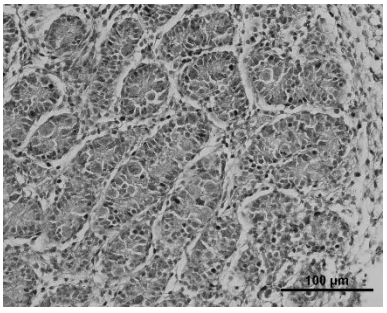


FIG. 28

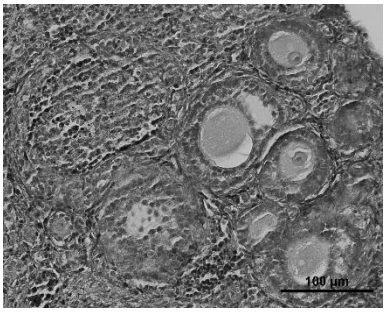


FIG. 29

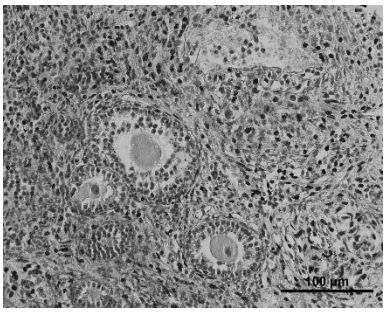


FIG. 30

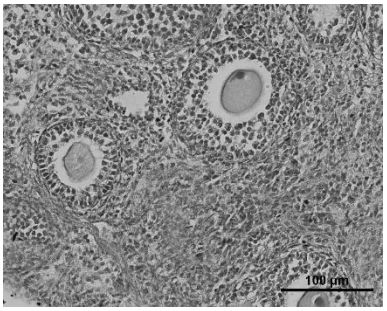


FIG. 31

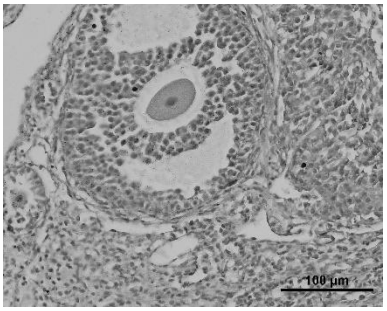


FIG. 32

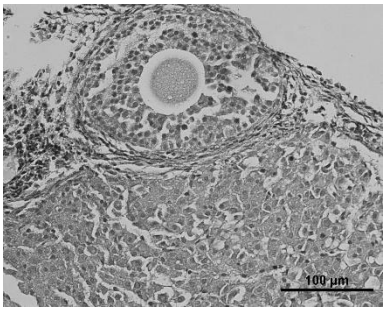


FIG. 33

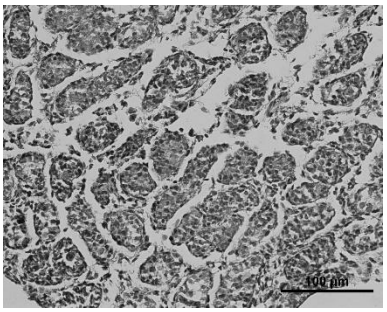


FIG. 34

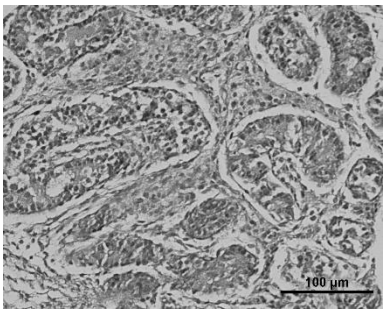


FIG. 35

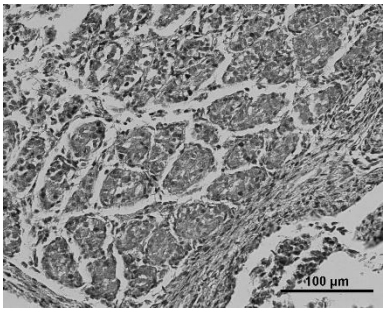


FIG. 36

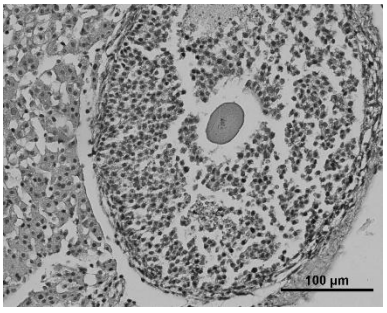


FIG. 37

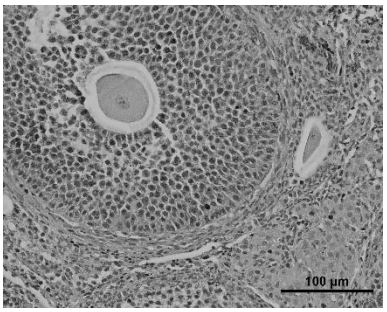


FIG. 38

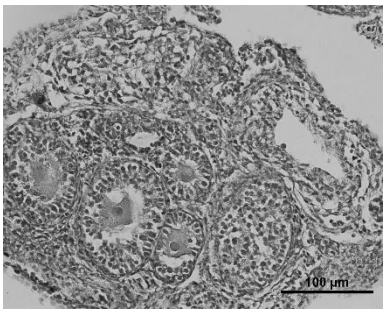


FIG. 39

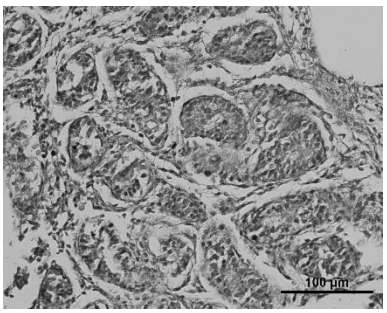


FIG. 40

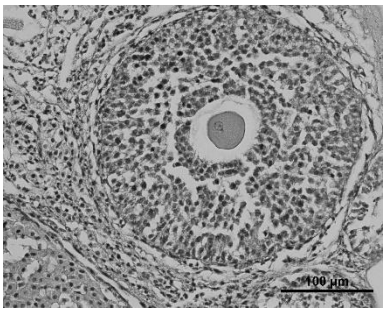


FIG. 41