Marine Biofouling and Its Impact on Marine Biodiversity with Special Reference to China

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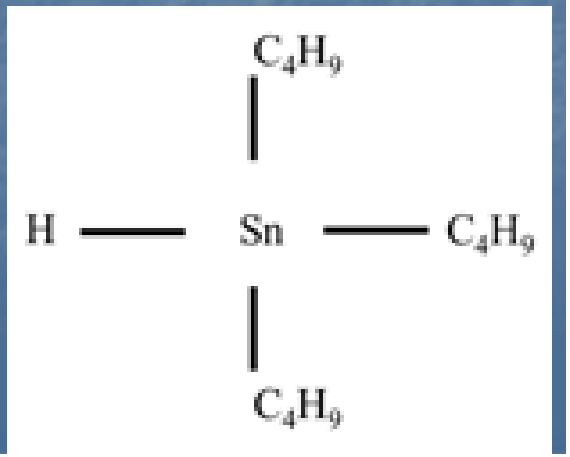
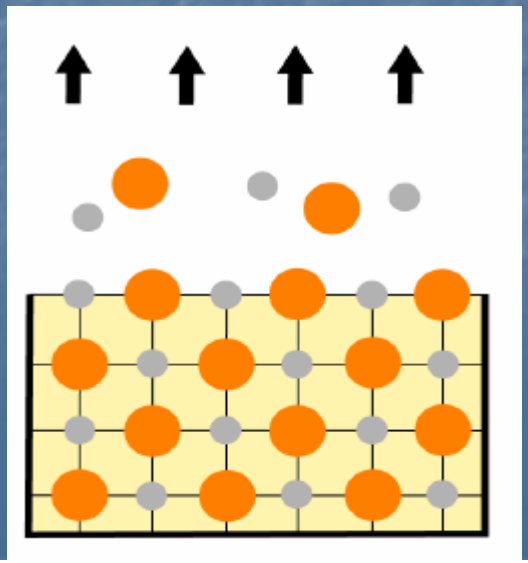
Outlines

- Marine biofouling and its harmful effects on environment
- IMO' measures and AFS Convention
- AFS Convention's impacts on China
- How China to address the issue
- Recommendations

Marine biofouling

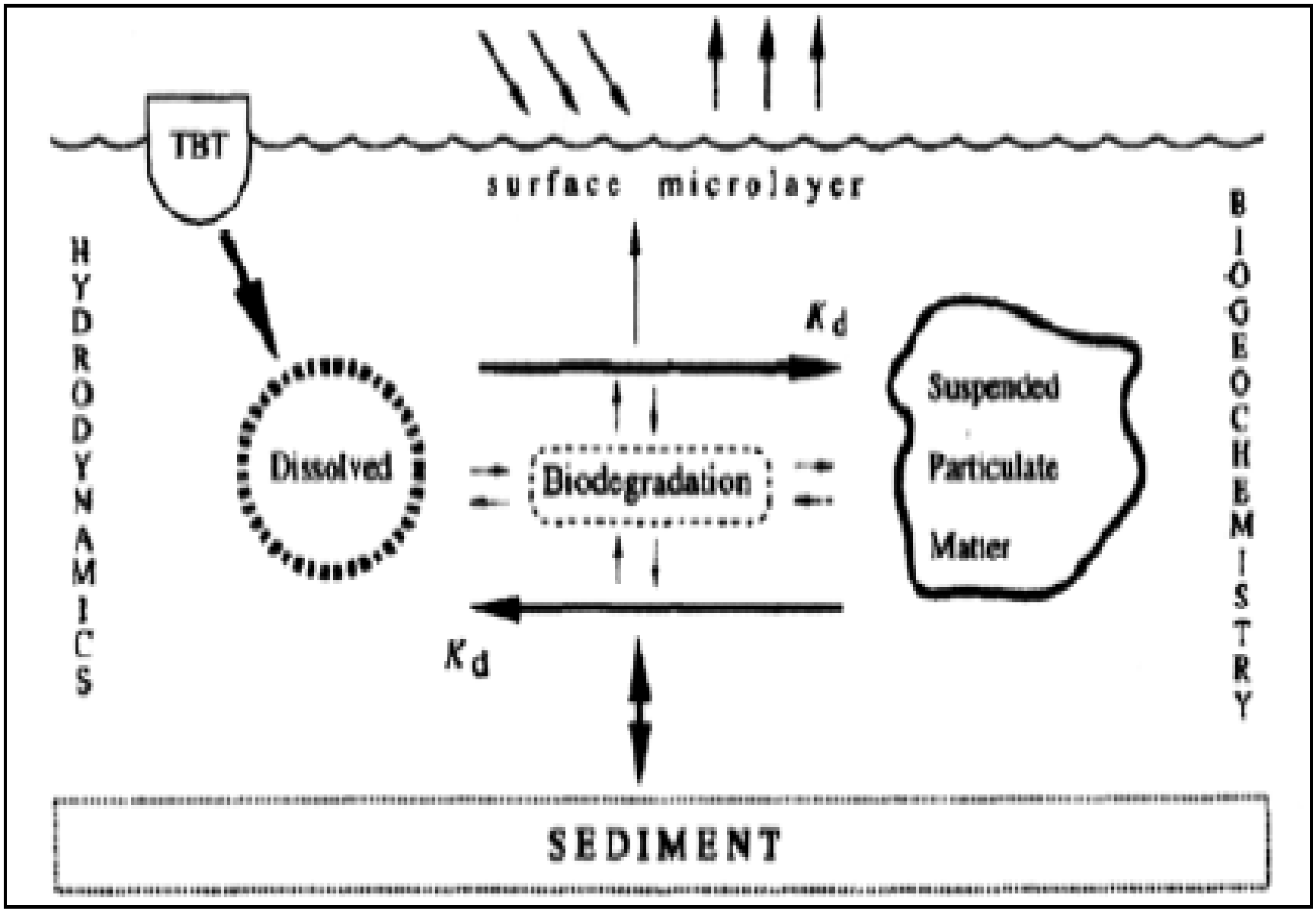
- What is fouling?
- Why we need antifouling?
- What an antifouling system is? TBT
- How does it work?
- What is the problem?





TBT's harmful effects on environment

- Water and sediments
- Shell malformations
- Imposex
- Marine mammals
- Reduced resistance to infection


TBT
surface microlayer
HYDRODYNAMICS
BIOGEOCHEMISTRY
Kd
Dissolved
Biodegradation
Suspended
Particulate
Matter
Kd
SEDIMENT

IMO' measures and AFS Convention

- 1990 MEPC adopted Resolution
- 1990-1999 MEPC Continues work
- 1999 Assembly Resolution A.895(21)
- 2001 IMO adopted AFS Convention
  - Sampling of AFS on Ships (MEPC.104(49))
  - Inspection AFS on Ships (MEPC.105(49))

2001 AFS Convention

- 1st Jan 2003, ships prohibited use TBT
- 1st Jan 2008, ships
  - not bear TBT on hulls or external surfaces; or
  - bear a coating that forms a barrier to TBT leaching.

AFS impacts on China

Environment

- Aquaculture
- Biodiversity
- Ecosystem
- Human being

Shipping Industry

- Alternatives
- Cost
- Toxic

How China address AFS issue

- Technical
- Legal
- Scientific
- Institutional

Technical

- Encourage development of alternatives
- Alternatives
  - Copper based anti-fouling paints
  - Tin-free anti-fouling paints
  - Non-stick coatings
- Developed national standard
- 30 manufactures with 100 productions

Legal

- Objectives
- 2003 Notification
- National legislation
- Ongoing status

Scientific

- 2005, 2008
- Sample points
  - 5 main ports Bohai Sea
  - 1 shipyard
- Sample Items

Comparison 2005 & 2008 - surface

SP	MBT：2005/2008	DBT：2005/2008	TBT：2005/2008
1	nd/nd	nd/nd	nd/nd
2	nd/nd	nd/nd	nd/nd
3	nd/nd	nd/nd	nd/nd
4	nd/nd	nd/nd	nd/nd
5	nd/nd	nd/nd	nd/nd
6	nd/nd	nd/nd	nd/nd
7	nd/nd	nd/nd	nd/nd

Comparison 2005 & 2008 - sediments

SP	MBT: 2005/2008	DBT: 2005/2008	TBT: 2005/2008
1	339.13/nd	nd/nd	nd/nd
2	456.17/17.03	nd/43.89	6.30/125.36
3	644.87/nd	nd/nd	6.51/4.92
4	707.31/nd	nd/6.54	nd/6.43
5	1434.57/nd	nd/nd	36.30/8.39
6	203.2/nd	nd/5.01	26.00/3.24
7	89.6/nd	nd/4.94	11.0/3.69

No.	MBT（ngSn/g）	DBT（ngSn/g）	TBT (ngSn/g）
1#Mollusk	nd	1.92	nd
2#Oyster	nd	nd	3.46
1#Algea	nd	nd	nd
2#Algea	nd	3.22	nd

Result & trends

- Surface water – easy to degradation
- Sediments – difficult to degradation
- Species – effected by TBT
- Lower

Institutional

- National Task Force
- National policy
- All the stakeholders
- Some actions
  - CCS – alternative paints type approval
  - CCS - survey and certification to ships

Outcomes of China

- Alternatives developed
- Draft national legislation
- Scientific research
- National Task Force
- 1,000 International ships Certificate of Compliance
- No TBT saled on market
- TBT lower in environment

Recommendations

- Ship owner motivated
  - Awareness raising
  - satisfied alternatives
  - Market factors
- Government implementation
  - Rectify AFS Convention
  - Port State Control Inspection
  - New technical R&D
  - Monitor environment

Questions?

Thank you!