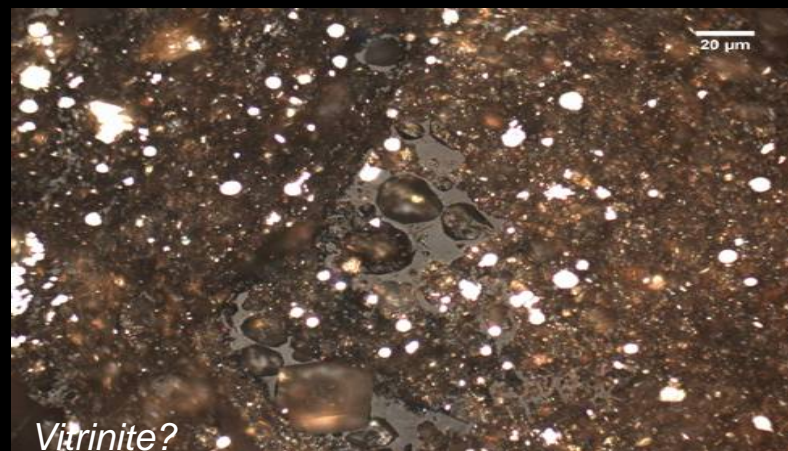# ICCP Working Group Identification of Thermal Maturity Relevant Organic Matter 2019 Report

Paul C. Hackley - U.S. Geological Survey, Reston, Virginia, USA

Presented for ICCP Commission II, September, 2019

Outline

o Problem to be solved

o History of the ICCP working group

o Summary of 2015-2016 exercise, submitted manuscript

o Summary & proposal for new activities

Vitrinite?

Vitrinite?

Presented for ICCP, September, 2019

Objective of the working group

○ Provide guidelines for identification of thermal maturity relevant organic matter population in dispersed organic matter
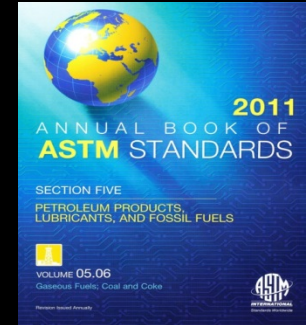

Vitrinite?

Vitrinite?

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Vitrinite?
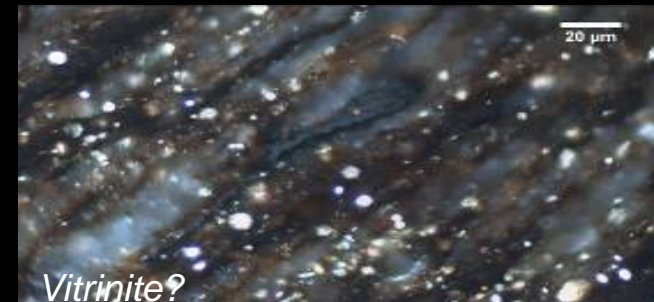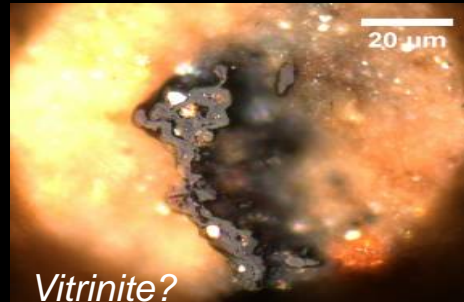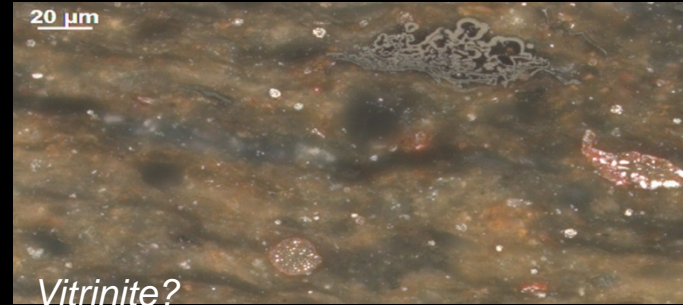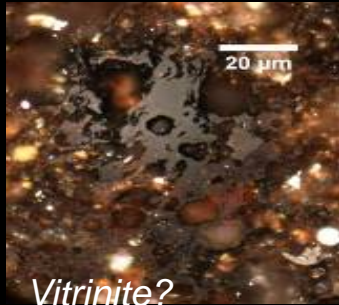
History of the working group

o Proposed by Angeles Borrego 2008 Oviedo

o DOMVR survey 2009 Gramado, ICCP News No. 48

o ASTM standard D7708 in 2011 ASTM Standards

Designation: D7708 – 11

Standard Test Method for
Microscopical Determination of the Reflectance of Vitrinite
Dispersed in Sedimentary Rocks[1]

2011
ANNUAL BOOK OF
ASTM STANDARDS

SECTION FIVE
PETROLEUM PRODUCTS,
LUBRICANTS, AND FOSSIL FUELS

VOLUME 05.06
Gaseous Fuels; Coal and Coke

Oviedo 2008   *Gramado 2009*   *Belgrade 2010*   *Porto 2011*

History of the working group, cont.

- o ASTM D7708 interlaboratory study (ILS) in 2012-2013

- o Results presented Sosnowiec 2013

- o Results presented AAPG, Houston, USA, 2014

- o Results published in J. Marine and Petroleum Geology, 2015 (60+ citations)

Porto 2011   *Beijing 2012*   *Sosnowiec 2013*   *Kolkata 2014*   *Potsdam 2015*

History of the working group cont.

o New interlaboratory study, 2015-2016

o Results presented Houston 2016

o Discussions, 2017-2018

o Manuscript accepted (prov.), 'significant modifications' Marine & Pet. Geol., Sept 11, 2019

Potsdam 2015   Houston 2016   Bucharest 2017   Brisbane 2018   The Hague 2019
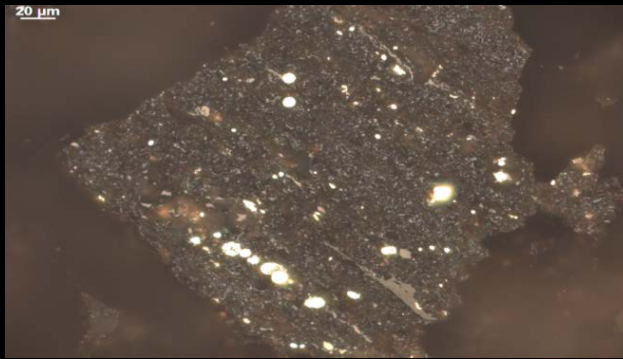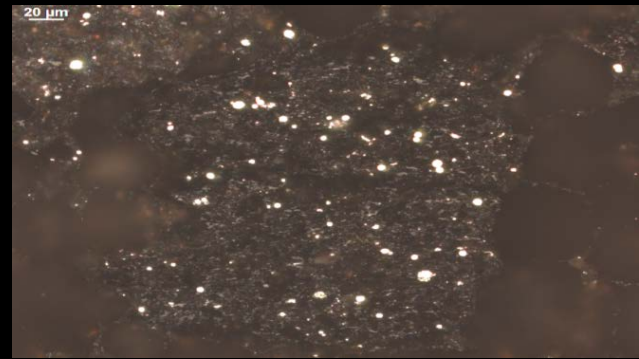
2015-2016 Interlaboratory Study (ILS)

o   Six high maturity samples with high TOC – current USA shale gas/tight oil plays

Haynesville: TOC 2.87 wt.%, Ro ~ 1.7%   *Eagle Ford: TOC 5.48 wt.%, Ro ~ 1.8%*   *Marcellus: TOC 5.63 wt.%, Ro ~ 2.0%*

Summary of 2015-2016 ILS

- o The results (all inclusive) were terrible for reproducibility

- o Some statistical method needed to eliminate outliers

- o Solid bitumen vs vitrinite identifications continue to plague organic petrography of NA shales

- o These samples were representative of NA shales, and high TOC

Refine results (remove outlying values)

- Remove AUSMD >1.0

- Remove IUSMD>1.0

- Remove results anyway non-compliant to D7708?

- Remove results where s.d> 0.15*Ro

- Remove results where n<20?

- Remove results not following D7708 template?

- Remove by traditional approaches

Remove IUSMD>1.0
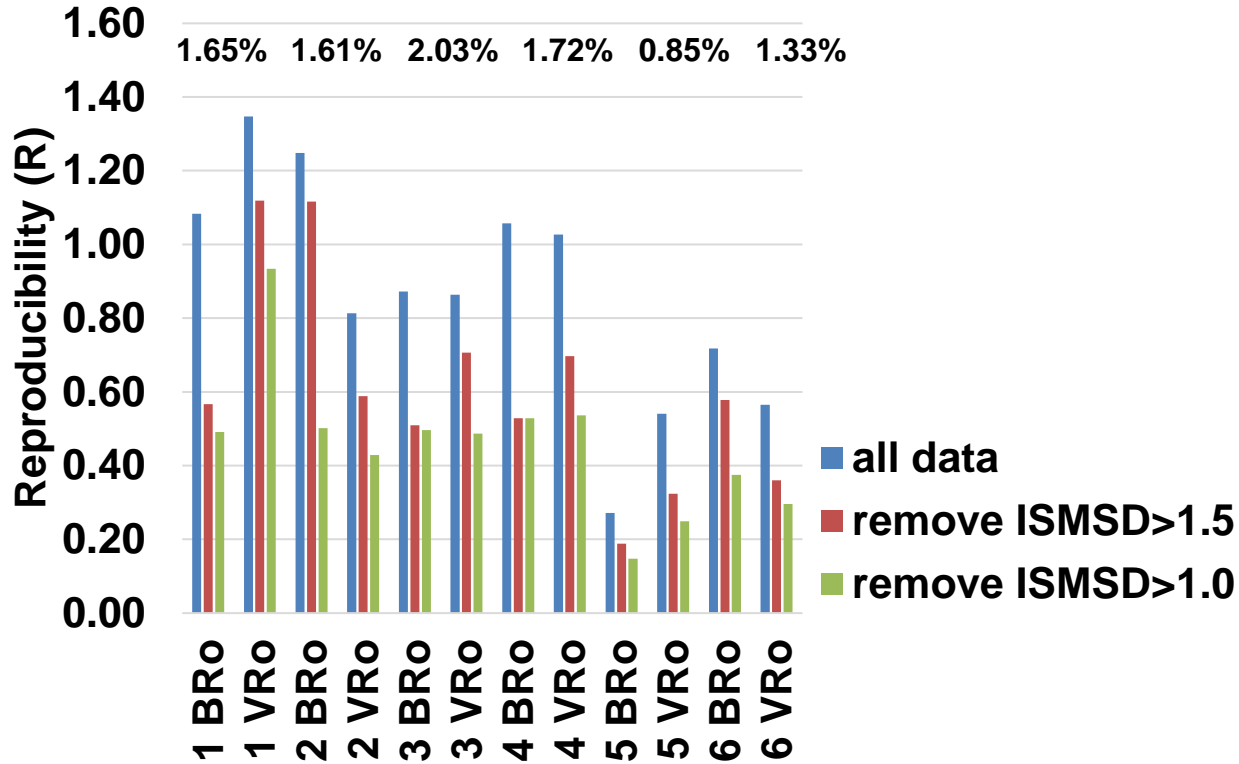
- ❏ **Requires pool of data**
- ❏ **Removing >1.5 consistent improvement**
- ❏ **Removing >1.0 consistent improvement**
- ❏ **Acceptable R values (0.15 to 0.93%)**
- ❏ **Need pool of data!**

Presented for ICCP, September, 2019

Summary of data refinement

o Remove AUSMD >1.5: consistent improvement

o Remove IUSMD>1.0: best results

o Remove non-compliant to D7708: no improvement

o Remove s.d> 0.15*Ro: consistent improvement

o Remove n<20: inconsistent

o Remove non-D7708 template: inconsistent

o Remove outside 10-90 percentile; Remove outside mean +1.5*interquartile: consistent improvement

Summary of reproducibility (R)

- Oil window (e.g. Bakken): R ~0.1 to 0.2
- Wet gas/condensate window (e.g. Woodford): R ~0.3
- Dry gas window (e.g. Marcellus): R ~0.4 to 0.5

- Similar to previous studies
- Indicates continued need for improvement/standardization
- Provides realistic uncertainty in Ro measurement

Proposal for New Activities 2019-2020

o A photographic round robin with same samples to see what people identify as vitrinite vs solid bitumen

o Use marked PowerPoint with Excel template for answers

o A round robin using Hilgers Fossil Student on calibrated images from same samples

Proposal for New Activities 2020 ...

○ New round robin with different (but similar) samples

○ Ask for solid bitumen reflectance instead of vitrinite

○ Use lessons learned, insist on s.d.<0.15*Ro

Thanks!