



Chemical Laboratory

Concrete Section

Materials Engineering and Research Office

Highway Standards Branch

Provincial Highways Management Division

Ministry of Transportation Ontario

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Chemist

XRF2005 first week



Provincial Highways Management Division Ministry of Transportation Ontario





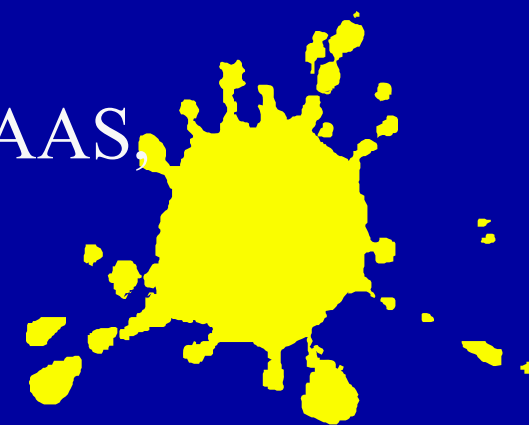
Scope of testing/ Materials

- ◆ Pavement markings (white, yellow, orange, black)
 - Paint – organic solvent based paint, water borne traffic paint
 - Durable – thermoplastic, screed and textured field reacted polymeric material, preformed plastic tape
- ◆ Glass beads (used to achieve retroreflectivity of pavement markings)
- ◆ Structural steel coatings (bridge paints)





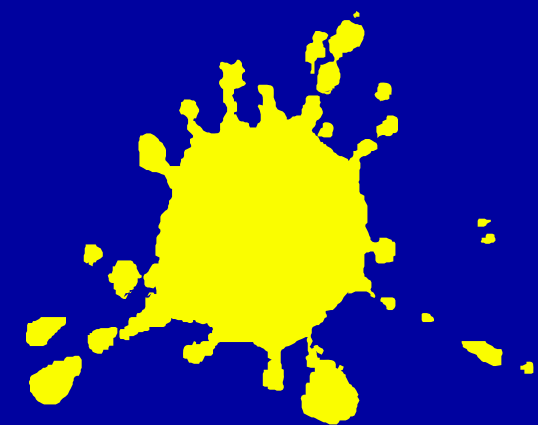
Scope of testing/Materials

- ◆ Purpose – evaluation, approval and quality assurance (contract sample formulation is compared to originally approved reference sample)
 - ◆ Basic physical testing (e.g. colour, luminance, retroreflectivity for pavement markings)
 - ◆ FTIR for the “signature” of the binding (organic part of a paint)
 - ◆ Inorganic analysis of pigment/filler (AAS, EDXRF)
- 



Inorganic analysis

- ◆ AAS for Ca, Pb, Cr, Al, Ti, and Mg in traffic markings and Ca, Zn, Al, Mg, Ti, Fe, and Si in bridge paints
- ◆ From October 2009 EDXRF for analysis of traffic markings (including Si) and As and Pb in glass beads



The instrument – EDXRF MiniPal 4

- ◆ Rh tube
 - min. 4 kV max. 30 kV
 - min. 1 μ A max. 1 mA
 - max. 9 W
- ◆ Sample spinner
- ◆ He flush
- ◆ Silicon drift detector
- ◆ 12 position sample changer

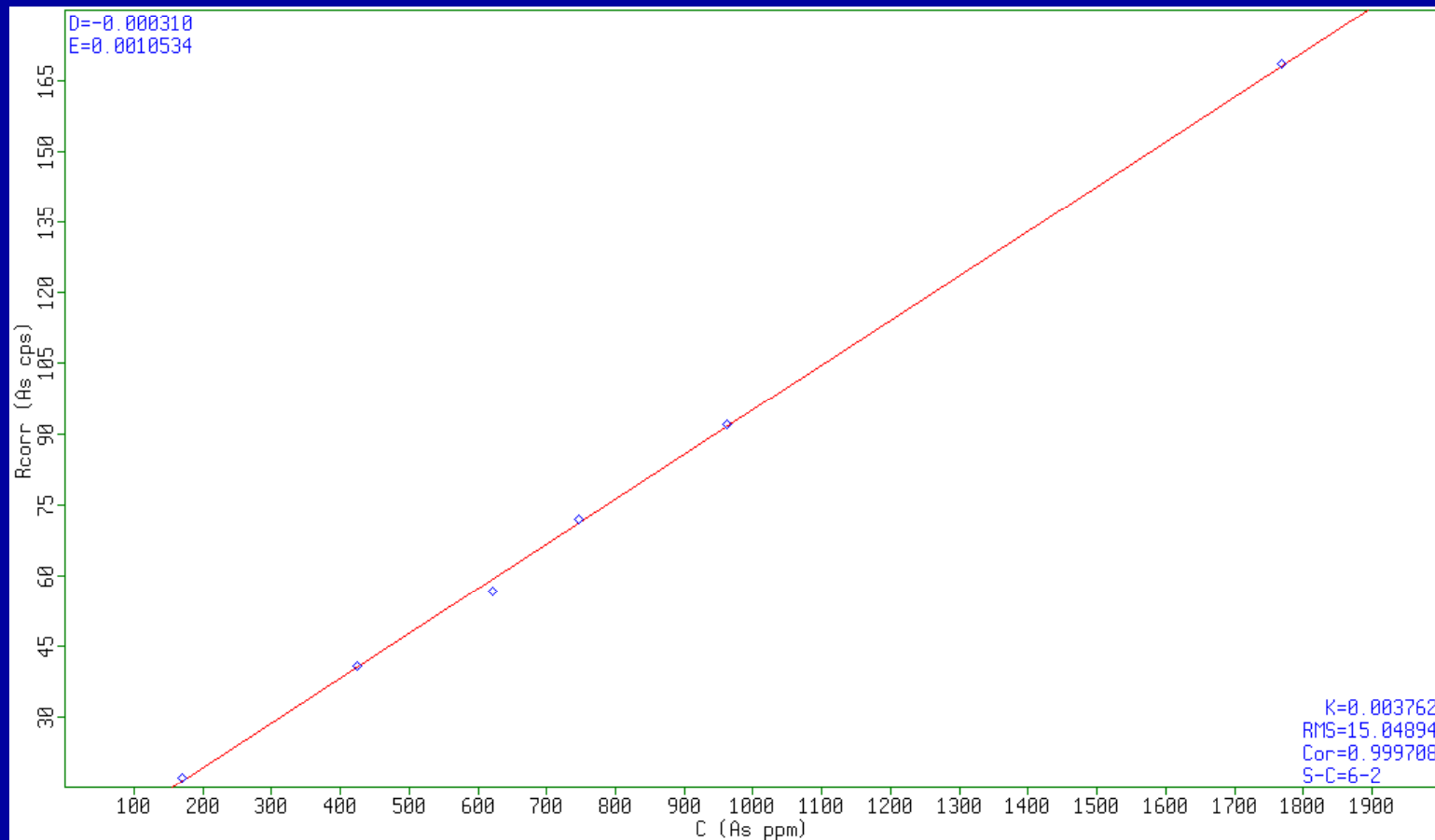


Analysis of glass beads for As, Pb

- ◆ 20 g sample in a plastic cup with Mylar film
- ◆ Calibration on 5 ASTM F40 working standards with As & Pb content determined previously by ICP

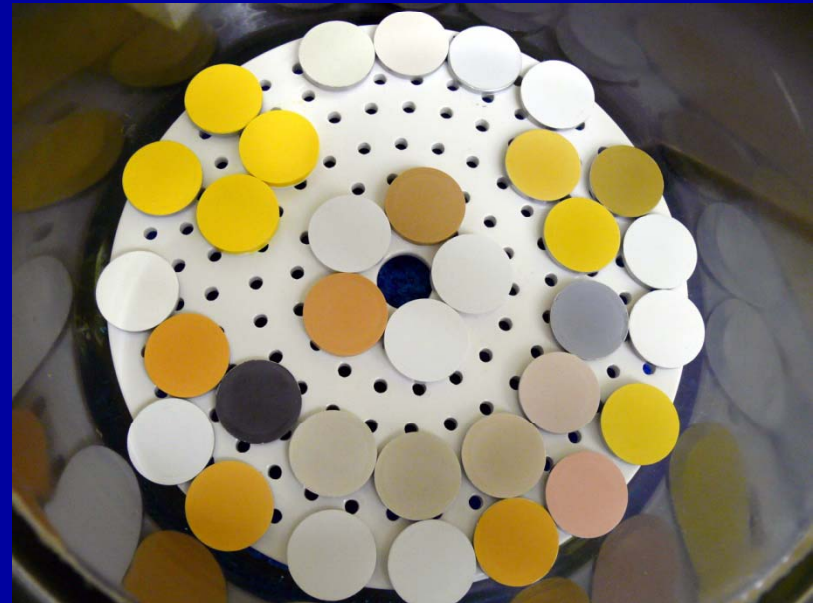


As in glass beads calibration curve



Analysis of pigments/fillers in pavement markings

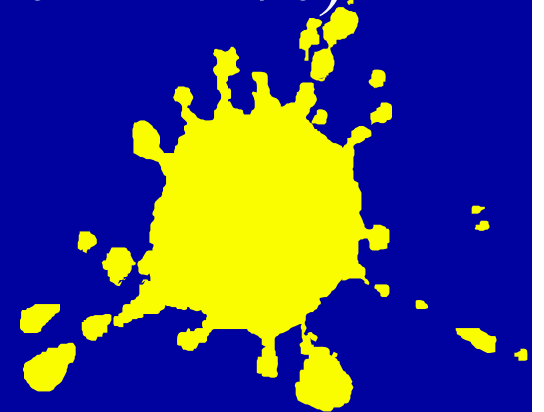
- ◆ Paint ashed in a muffle furnace for the removal of carbonaceous matter. Inorganic pigments/fillers remain
- ◆ 32 mm pressed pellet samples – 4 grams of pigment mixed with 2 grams of boric acid on a backing of 2 grams of boric acid
- ◆ Pellets pressed on Angstrom 4451A Briquet press @ 25 000 pounds for 30 seconds



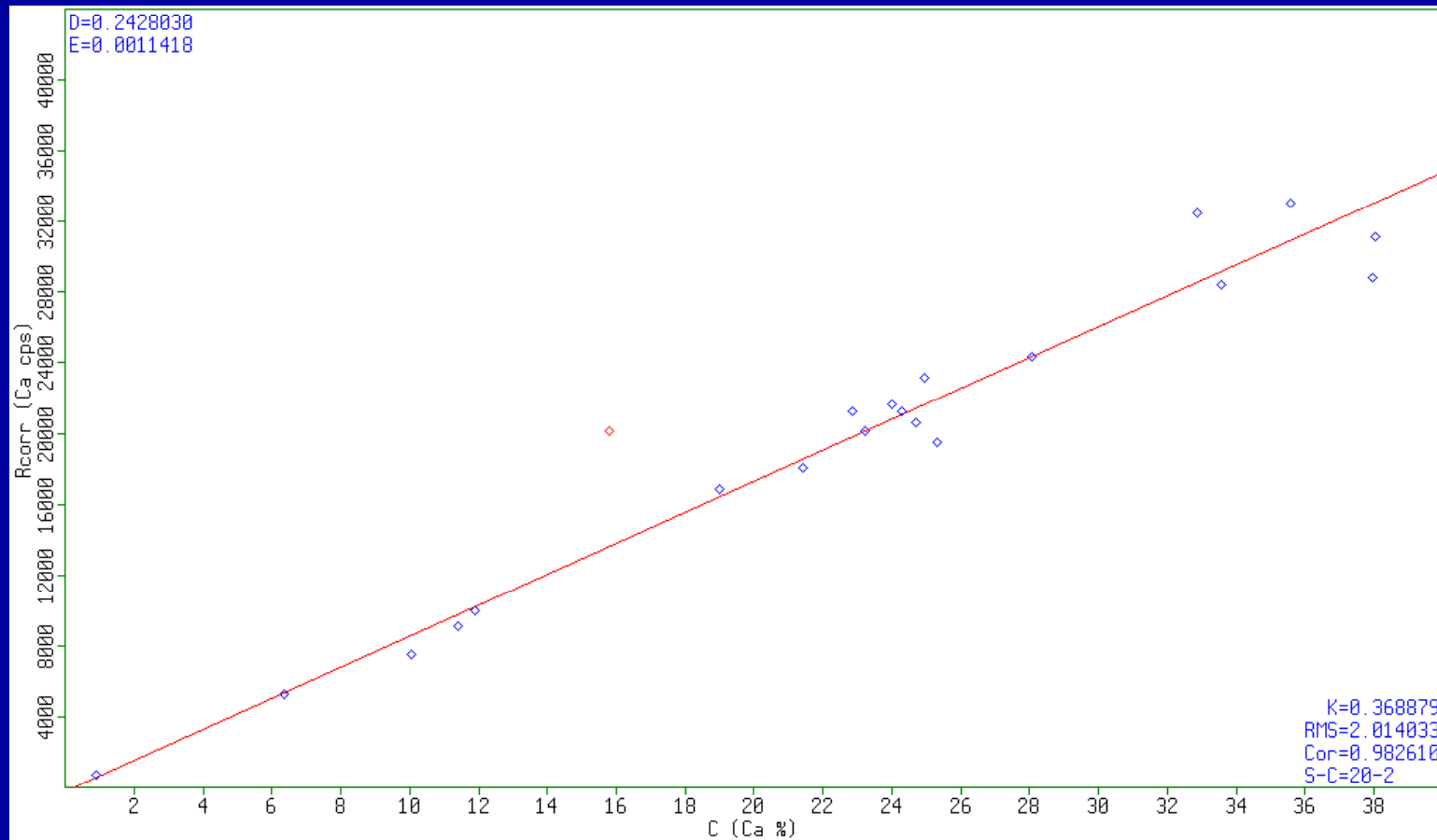


Analysis of pigments/fillers in pavement markings

- ◆ Analysis of Ca, Mg, Al, Ti, Si, Pb, and Cr
- ◆ Calibration based on the combination of in house samples previously analysed by AAS and SRMs (up to 22 standards). Some elements present in a very wide range of concentrations (e.g. Ca from 0.9% to 38%)



Ca in pavement markings calibration curve





Plans for the future

◆ Analysis of bridge paints on EDXRF

- More complicated – more elements of interest, samples much more varied
- Difficult calibration
- Often very high binder content (e.g. 70%) – more difficult to prepare enough powder for a pressed pellet. A lot of ashing required!

