This document was produced by scanning the original publication.

Ce document est le produit d'une numérisation par balayage de la publication originale.

M. S.D. (Dr. R.L. Cunningham)
MHB for RLC

CANADA

DEPARTMENT OF ENERGY, MINES AND RESOURCES

OTTAWA

MINES BRANCH INVESTIGATION REPORT IR 72-50

PETROGRAPHY OF ROCK SPECIMENS FROM THE OLD WATERFRONT TRADING POST AT HALIFAX, NOVA SCOTIA

by

JAMES A. SOLES

MINERAL PROCESSING DIVISION

NOTE: THIS REPORT RELATES ESSENTIALLY TO THE SAMPLES AS RECEIVED.

OCTOBER 1972

COPY NO. 8

Unclassified

Mines Branch Investigation Report IR 72-50

PETROGRAPHY OF ROCK SPECIMENS FROM THE OLD WATERFRONT TRADING POST AT HALIFAX, NOVA SCOTIA

by

James A. Soles*

- - -

RESUME

Restoration of historic sites requires study of the materials used for construction, so that acceptable substitutes may be found for reconstruction should the original no longer be available.

This report describes the petrography of two rock types, a sandstone and a quartz monzonite, used extensively as building stones in the old waterfront trading post at Halifax, N.S. The locations of a few similar rocks are given.

*Mineralogist, Ore Mineralogy Section, Mineral Processing Division, Mines Branch, Department of Energy, Mines and Resources, Ottawa, Canada.

INTRODUCTION

Two small specimens* of rock, one crystalline and the other apparently sedimentary, were sectioned and their compositions determined by petrographic and X-ray analysis. The specimens, taken from rocks used as building stones in an old trading post on the Halifax, Nova Scotia waterfront, were provided by Mr. Robert Orr of the Restoration Services Division, Department of Indian Affairs and Northern Development. He wished to know their composition and petrographic classification, and the types of rock which could be used as substitutes.

Mr. F. E. Hanes of this Division kindly assisted in reviewing the occurrences of similar rocks in eastern Canada.

PROCEDURE

The specimens were impregnated with dyed epoxy to reveal their porosities, and thin sections were prepared for petrographic analysis. A sample of the sedimentary rock was crushed to minus 0.5 mm size, tumbled to free some of the finer intergranular material, and the finest fraction was analyzed by X-ray diffraction in a Guinier-deWulff camera. A fragment was also leached with 1M HCl and the extract tested for iron.

The mineralogical compositions were determined by point count analysis of the thin sections with a petrographic microscope.

---

* MP-MIN-1584; Sections: LS-10-72, LS-11-72; XRD: G-1096

RESULTS

The compositions of the specimens and grain sizes of the constituent minerals are given in Tables 1 and 2.

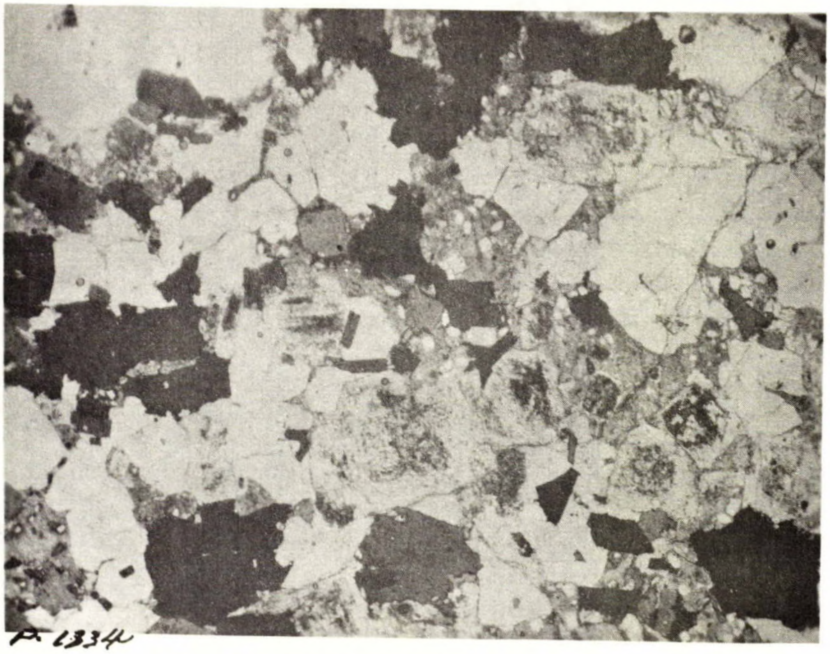
Crystalline Rock

The crystalline rock, presumed to be igneous, has the mineralogical composition of quartz monzonite. Plagioclase feldspar is mostly euhedral and zoned, with the anorthite content ranging from An_{20} to An_{30} (oligoclase). Potassium feldspar is subordinate to plagioclase, and is interstitial to it and to biotite, which occurs as large books and irregular masses. Muscovite (?) is dusted through the cores of plagioclase crystals. Accessory minerals are scattered about, but zircon occurs principally in biotite, where pleochroic halos have developed. Figure 1 shows most features.

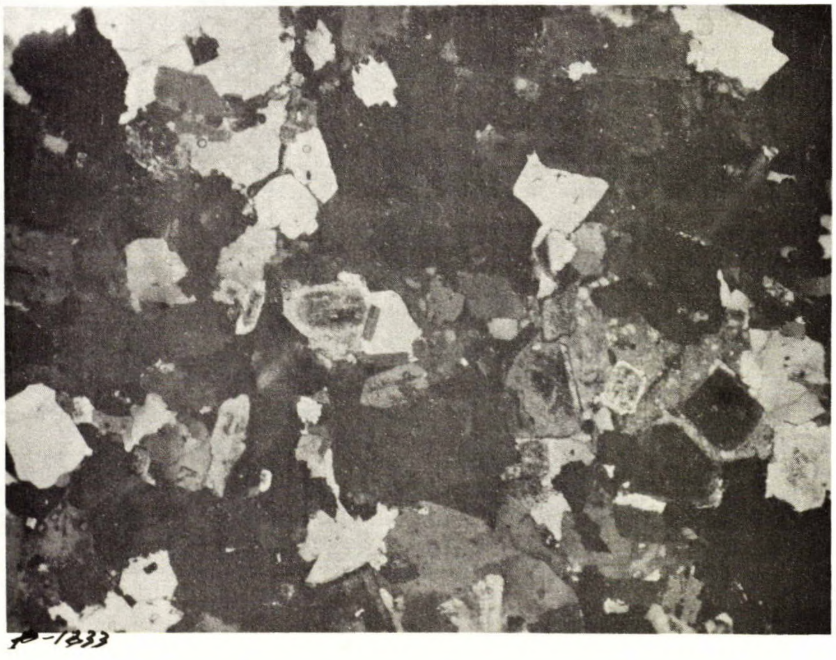
TABLE 1

Petrographic Analyses of the Rock Specimens

Minerals	Crystalline Rock		Sedimentary Rock	
	Propor'n, %	Grain Sizes, mm	Propor'n %	Grain Sizes, mm
Quartz	29	0.1 - 3	43	.05 - 0.5
K-Feldspar	15	0.1 - 3	23	.03 - 0.4
Plagioclase (An_{25})	28	0.2 - 3	20	.03 - 0.4
Biotite	26	0.5 - 4	-	-
Rock Fragments	-	-	4	.05 - 0.5
Zircon, Magnetite, Apatite, Sphene	<0.1	0.2	<0.1	<0.1
Muscovite	0.4	0.2	<10	Micron sizes, intergranular
Chlorite, other clay minerals, hematite	<2 (Altered primary min'ls)			
Mounts	Section LS-11-72		Section LS-10-72	

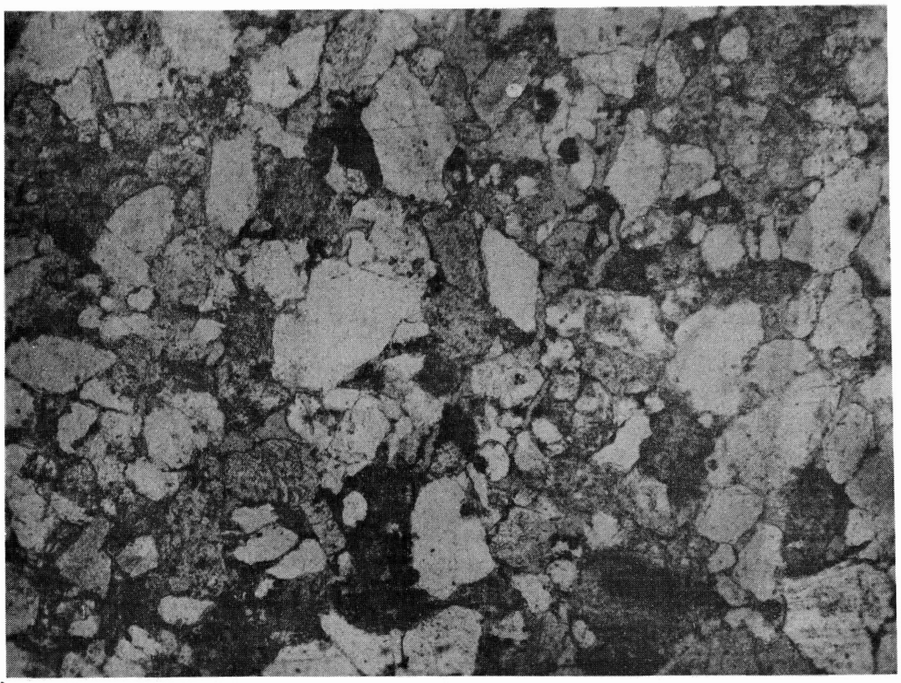


A. Polarized Light



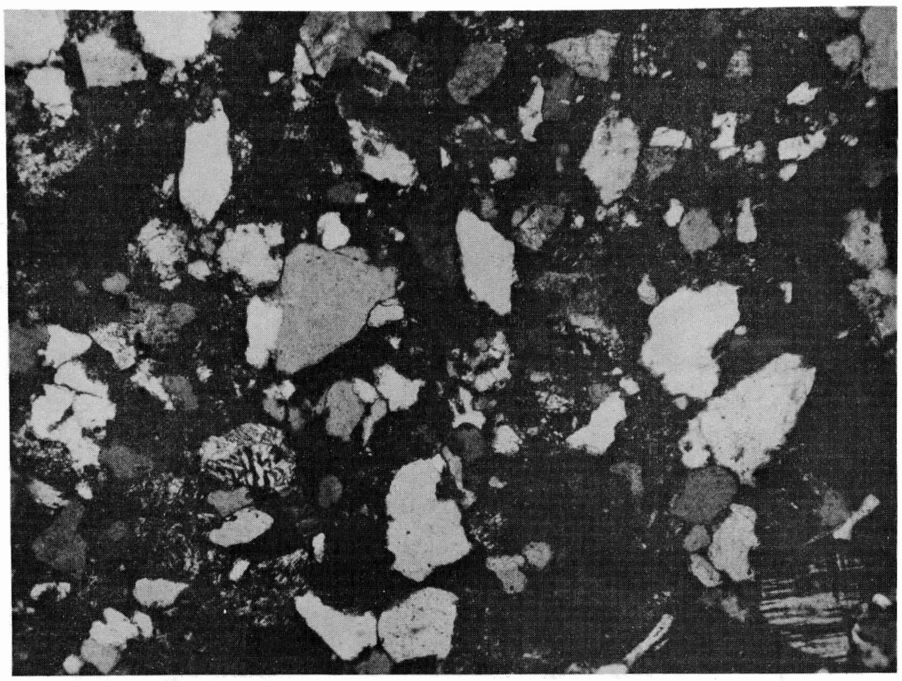
B. Crossed Polarizers

Figure 1. Photomicrographs of quartz monzonite, showing:
(A) plagioclase euhedra with altered cores, quartz (mostly white), intergranular K-feldspar (grey, spotted), and biotite books (dark);
B) zoning in the plagioclase feldspar.
Magnificiation X15.



p.1331

A. Polarized Light



p-1332

B. Crossed Polarizers

Figure 2. Photomicrographs of sandstone, showing light-coloured, sub-angular grains of quartz and feldspar with darker altered rock fragments in a rather sparse, fine-grained matrix of similar composition. Hematite may be dusted through altered fragments or localized in the matrix (black areas). Pores (about 5%) are distinguishable from matrix materials as isotropic areas in (B). Magnification X50.

Sedimentary Rock

The specimen of sedimentary rock is a relatively porous feldspathic sandstone. The clasts are equigranular, sub-angular and mostly monomineralic; they consist principally of quartz, potassium and plagioclase feldspars, and partly altered rock fragments that usually contain a dusting of hematite (Figure 2). The rock is fairly cohesive, in that the sand grains are closely compacted, but no recrystallization or cementation of grains has occurred. The intergranular material is finely particulate and similar in composition to the grains; X-ray diffraction analysis shows that it consists mostly of quartz and plagioclase, with small amounts of muscovite, kaolin and chlorite. The hydrochloric acid leach test showed that extractable iron was present; its source may be chlorite, hematite or a hydrate. No sulphide was detected.

DISCUSSION

The quartz monzonite is similar in appearance to rock quarried at the following locations[1] in Canada:

Rivière à Pierre, Quebec	- 'Blue' granodiorite
Stanstead, Quebec	- 'Grey' quartz monzonite
St. Sebastien (Megantic), Que.	- 'Grey' granite
Middleton-Nictaux, Nova Scotia	- 'Grey' granodiorite

Differences in mineralogical content, texture, grain size and weathering character will dictate whether or not a given rock is acceptable as a substitute. Possibly only a particular area within a quarry will provide suitable material.

It is even more important that any substitute selected for the sandstone should develop a similar weathered surface, or it will contrast rather quickly with the original. Iron sulphides and carbonates in sedimentary rocks oxidize rapidly, causing marked colour changes, whereas iron silicates (e.g., chlorite) weather more slowly and may not develop offensive stains. The end product of weathering of a potential substitute should therefore be examined prior to its use; a long-exposed quarry or outcrop would provide the best surfaces for comparison.

In the Maritime provinces, building stones of the sandstone variety were obtained almost exclusively from rocks of Middle Carboniferous to Permian age, which extend from Chaleur Bay to Cape Breton(2). Several quarries were operated in the past, but at present the commercial production is limited to the Wallace area in Cumberland County, N.S. From Parks' descriptions, the specimen examined appears petrographically similar to either the Wallace sandstone (Upper Carboniferous) or parts of the Millstone grit (Lower Carboniferous, e.g., Miramichi River, Shediac and Shepody bays).

REFERENCES

1. Carr, G.F., "The Granite Industry of Canada"; Canada Dept. of Mines & Tech. Surveys, Mines Branch Publ. 846 (1955).

2. Parks, W.A., "Report on the Building and Ornamental Stones of Canada"; Canada Dept. of Mines, Mines Branch Publ. 203 (1914).

JAS/am