Gold occurrence in radioactive calc-silicate float at Sandybeach Lake, Nueltin Lake area, District of Keewatin

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Abstract

Ground investigation of an airborne gamma-ray spectrometric anomaly characterized by high equivalent uranium and eU/eTh ratio has revealed boulders of white, chalky, tourmaline-bearing granite with up to 393 ppm eU contained mainly in uraninite. Adjacent to the granite is a well defined aeromagnetic anomaly where radioactive arsenopyrite-pyrrhotite-pyrite bearing calc-silicate float was found at two localities. These boulders contain significant gold concentrations (up to several ppm and with visible gold) and are enriched in U, W, Mo, and Co.

Résumé

Des recherches au sol, à la suite d'un levé aéroporté sur l'anomalie à l'aide de spectromètres à rayons gamma mettant en évidence un équivalent élevé d'uranium et du apport eU/eTh, ont révélées que des blocs erratiques granitiques à tourmaline, blancs, crayeux, ont une teneur de 393 ppm de eU présente en grande partie dans l'uraninite. Adjacente aux affleurements granitiques, une anomalie bien définie a été constatée dans des erratiques radioactifs calco-silicatés à arsénopyrite-pyrrhotite-pyrite trouvés à deux endroits. Ces blocs erratiques ont une teneur significative en or (jusqu'à plusieurs ppm d'or dont une certaine quantité est visible à l'oeil nu) enrichis en U, W, Mo et Co.

Introduction

During the summer of 1982 field work took place in southern District of Keewatin as a follow-up investigation of airborne gamma-ray spectrometer surveys (Geological Survey of Canada, 1978a, b; Charbonneau, 1982; Ford, 1982). The study area which contained highly radioactive granitic rocks is located to the west of Nueltin Lake (Fig. 1). The geology shown on Figure 1 is taken from Eade (1971, 1973) with modifications based on field observations during the 1982 field work and on interpretation of the airborne gamma-ray and aeromagnetic survey data.

Outcrop is scarce in the area. The terrain is generally flat, covered with a boulder till plain. Glacial direction is from slightly east of north.

Rock types in the area, from oldest to youngest, are 1) Archean? paragneiss, 2) meta-arkose which may include calc-silicates, 3) pre-Hurwitz quartz monzonite to granite including granodiorite gneiss, 4) Hurwitz Group including conglomerate, quartzite, greywacke, dolomite and limestone, 5) Aphebian granite-quartz monzonite, which varies from pink, massive, and medium grained to coarse grey, chalky, with abundant tourmaline, and 6) Helikian Nueltin Lake granite to quartz monzonite porphyry which is pink to grey, porphyritic, coarse grained, and commonly flourite-bearing.

Field work concentrated on three areas, indicated by arrows in Figure 1. Location 1 is a thoriferous veined portion of a Nueltin Lake porphyry body, where samples contained up to 460 ppm thorium and 0.2% rare earth elements. At location 2 samples of sulphide-bearing calc-silicate contained over 600 ppm uranium, 390 ppm molybdenum and 1.6 ppm gold (determined by neutron activation analysis). Samples from a quartz monzonite body at location 3 contained over 200 ppm uranium and 400 ppm molybdenum. Results of this work were presented at the 1985 GSC Current Activities Forum.

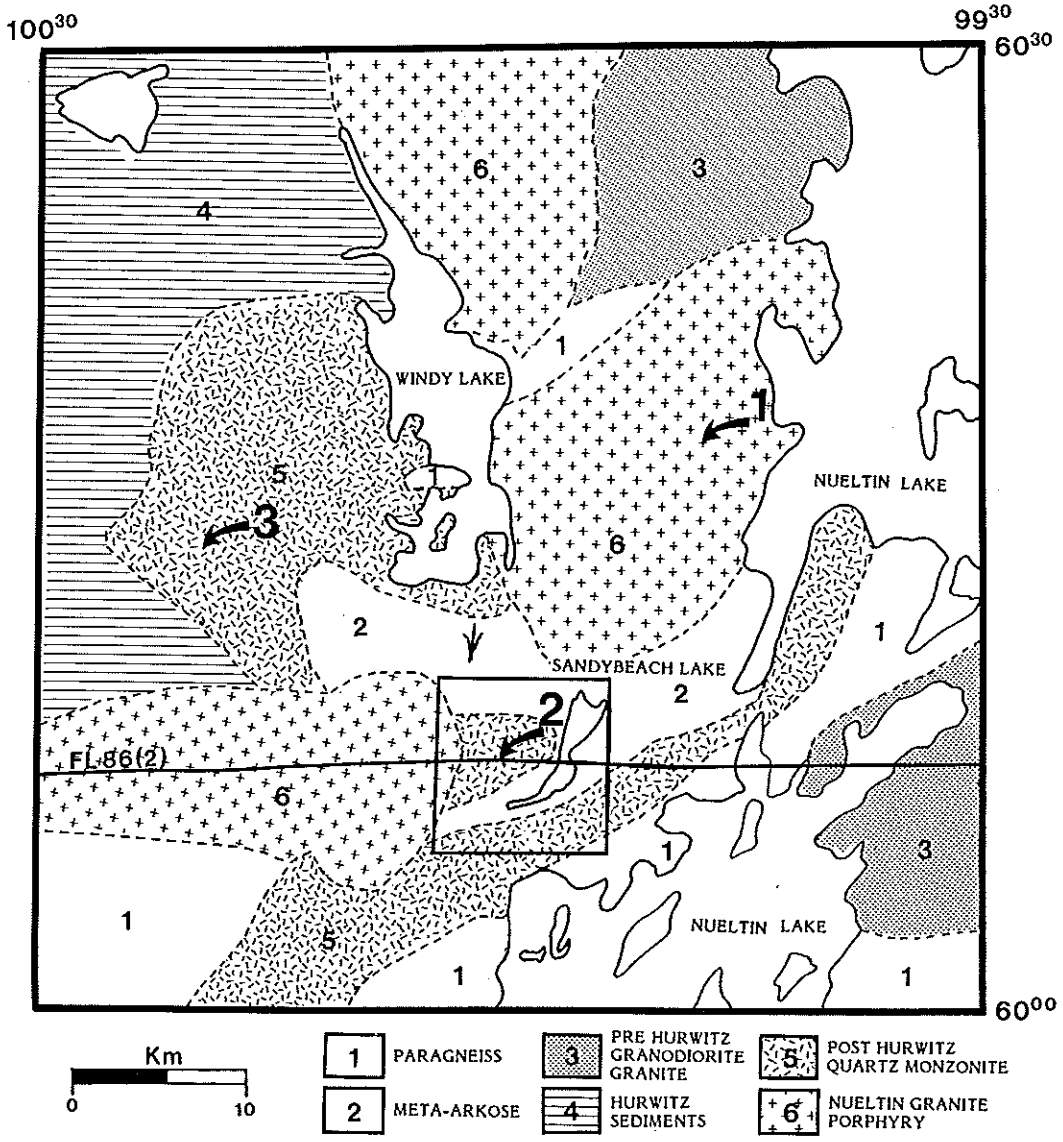

Figure 1. General geology, location of study area (box), and location of airborne gamma spectrometric flight line.

Further field work in 1985 at location 2 located sulphide-bearing calc-silicate boulders containing visible gold, scheelite and greater than 1000 ppm equivalent uranium. Laboratory analysis by graphite furnace atomic absorption spectrometry indicated gold concentration of 12.6 ppm.

Figure 2 is an aeromagnetic map (Geological Survey of Canada, 1965a, b) of the area outlined at location 2 on Figure 1, showing geological contacts from Figure 1, and sites for three samples described below. Figure 3 is the gamma-ray spectrometric profile for flight line 86(2) which is indicated on Figures 1 and 2. The gamma-ray spectrometric profile shows a prominent anomaly in equivalent uranium and eU/eTh ratio which correlates with the granitic plug (unit 5) to the west of Sandybeach Lake. The adjacent metasediment unit (unit 2) has lower radioelement content but shows a well defined aeromagnetic anomaly. On the west, the body of Nueltin Lake granite porphyry (unit 6) is sharply defined by an increase in thorium.

Sample description

Samples of radioactive tourmaline-bearing granite (CZ-162-82) and auriferous sulphide-bearing calc-silicate (CZ-172-82 and CZ-4B-85) were collected from blocks of float with dimensions of about one metre.

CZ-162-82 is approximately 10% biotite, 3% white mica, 20% quartz, 35% microcline and 25% plagioclase. Accessory minerals, totalling 7%, include fluorite, amphibole, tourmaline, apatite, monazite, zircon, xenotime, molybdenite, pyrite and uraninite. Major element content/composition is 76.2% SiO_2, 4.83% K_2O, 2.40% Na_2O, 0.93% CaO, and 0.08% TiO_2. The sample contains 393 ppm eU, 150 ppm eTh, trace Mo, and 800 ppm F. Other samples of this rock contain up to 3200 ppm F. Figure 4 is an autoradiograph of the radioactive granite and shows the distribution of radioactive minerals including uraninite, monazite, zircon etc.

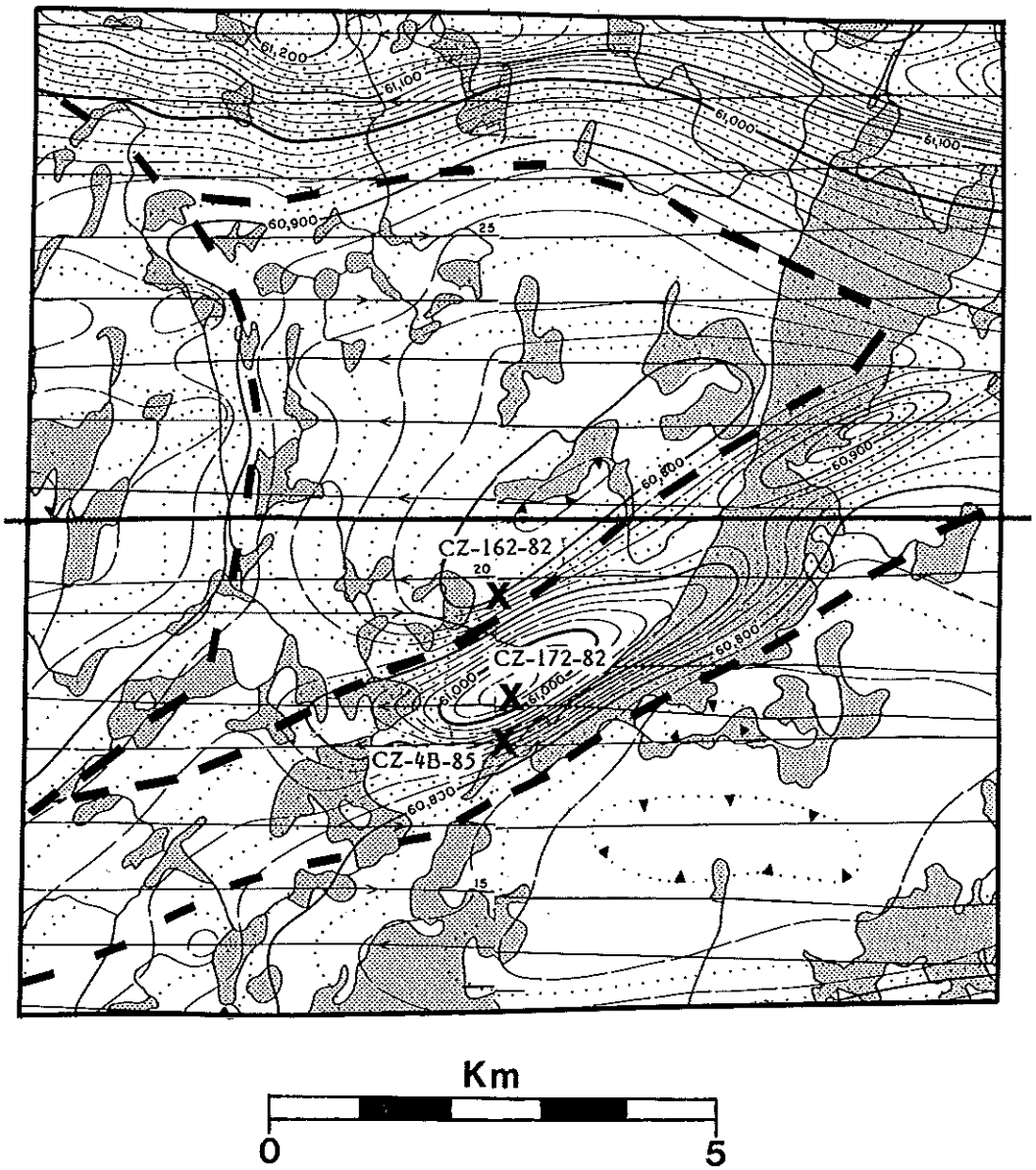

Figure 2. Aeromagnetic map of study area (box from Figure 1) showing location of airborne gamma spectrometric flight line. Geological contacts from Figure 1 are superimposed.

CZ-172-82 contains 50% plagioclase, 40% clinopyroxene and 5% pyrrhotite. Principal accessories and ore minerals amounting to 5% of the sample are amphibole, sphene, apatite, pyrite, molybdenite and uraninite with traces of cobaltite and chalcopyrite. The 1.6 ppm Au in this rock is mainly associated with pyrite and to some extent uraninite. Small inclusions of Au-Bi-Pb tellurides were noted in the pyrite. Pyrite concentrates were made which average 50 ppm gold. Microprobe analyses of some gold grains average 12.4% silver. Figure 5D shows the gold-pyrite relationship. Figure 4 is an autoradiograph from a cut face of sample CZ-172-82 and shows the distribution of uraninite sources both as discrete grains and veins.

CZ-4B-85 contains visible gold. The major minerals are 60% plagioclase with sericite alteration, 30% pyroxene and amphibole, and 5% biotite. The ore minerals, 5% in total, were identified as pyrrhotite, arsenopyrite, scheelite, with minor uraninite, molybdenite, native gold, tellurobismuthite, nickel telluride (melonite), lead telluride (altaite), chalcopyrite, cobaltite, ilmenite, and gold telluride (calaverite). Gold which averages 12.6 ppm in this sample occurs in uraninite (Fig. 5C), enclosed in pyrrhotite near arsenopyrite (Fig. 5B), and in gangue (Fig. 5A). No pyrite was identified in this sample and consequently this material is somewhat different from CZ-172-82.

Summary

This occurrence of gold at Sandybeach Lake is similar to the Gillander gold occurrence reported in the Northern Miner (Sept. 26, 1977) near Kasmere Lake in northern Manitoba. Both occurrences are in radioactive calc-silicates in proximity to radioactive granite. The Gillander occurrence was also outlined by follow-up investigation of federal-provincial airborne gamma-ray spectrometric surveys.

Although the Sandybeach occurrence is in float, the majority of the glacial drift in the area appears to be not far removed from its bedrock source. The granite plug and the entire northeast-trending belt of granite that runs through the study area towards Nueltin Lake are uraniferous and rich in tourmaline. The association of gold with tourmaline (Boyle, 1979) suggests that the contacts of these granite bodies with the metasedimentary belt (Fig. 2) may be favourable loci for gold occurrence.

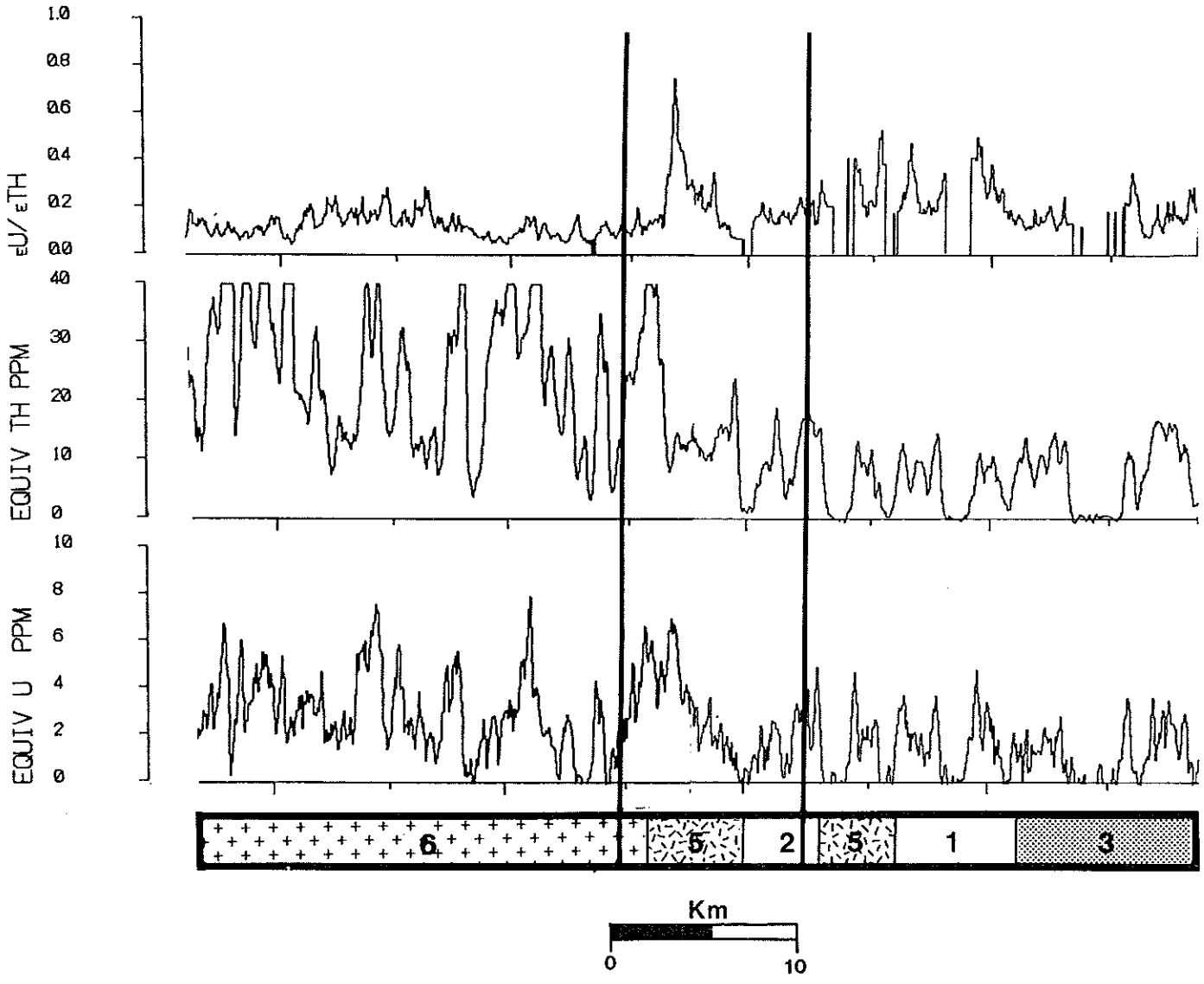

Figure 3. Airborne gamma spectrometric flight line 86(2) from Geophysical Series Maps 35265G and 35365G.

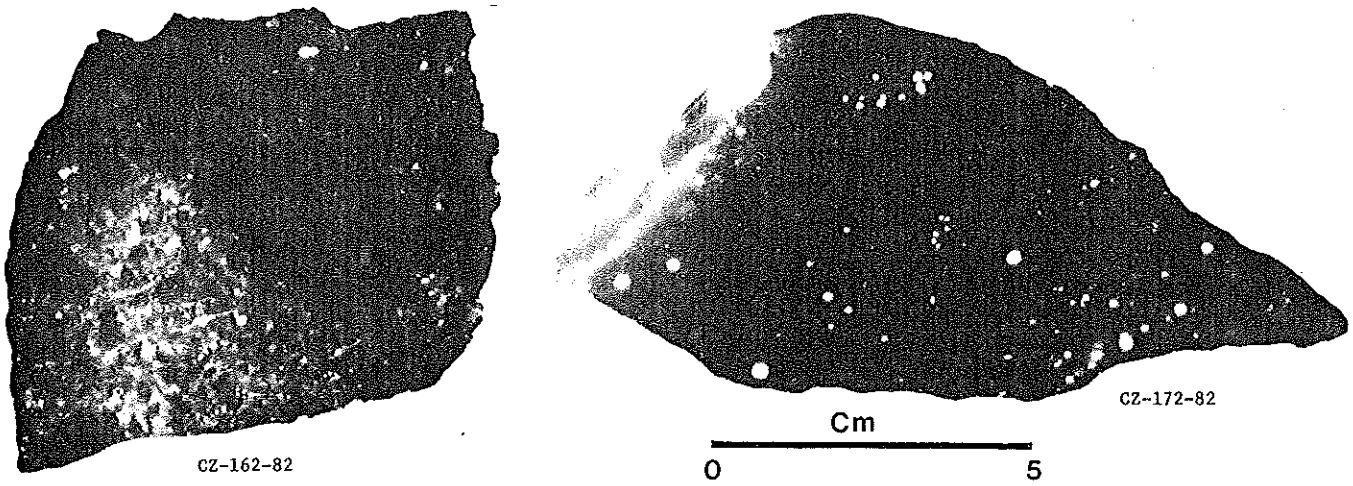

Figure 4. Autoradiograph of cut faces of radioactive tourmaline-bearing granite CZ-162-82 and radioactive calc-silicate CZ-172-82.

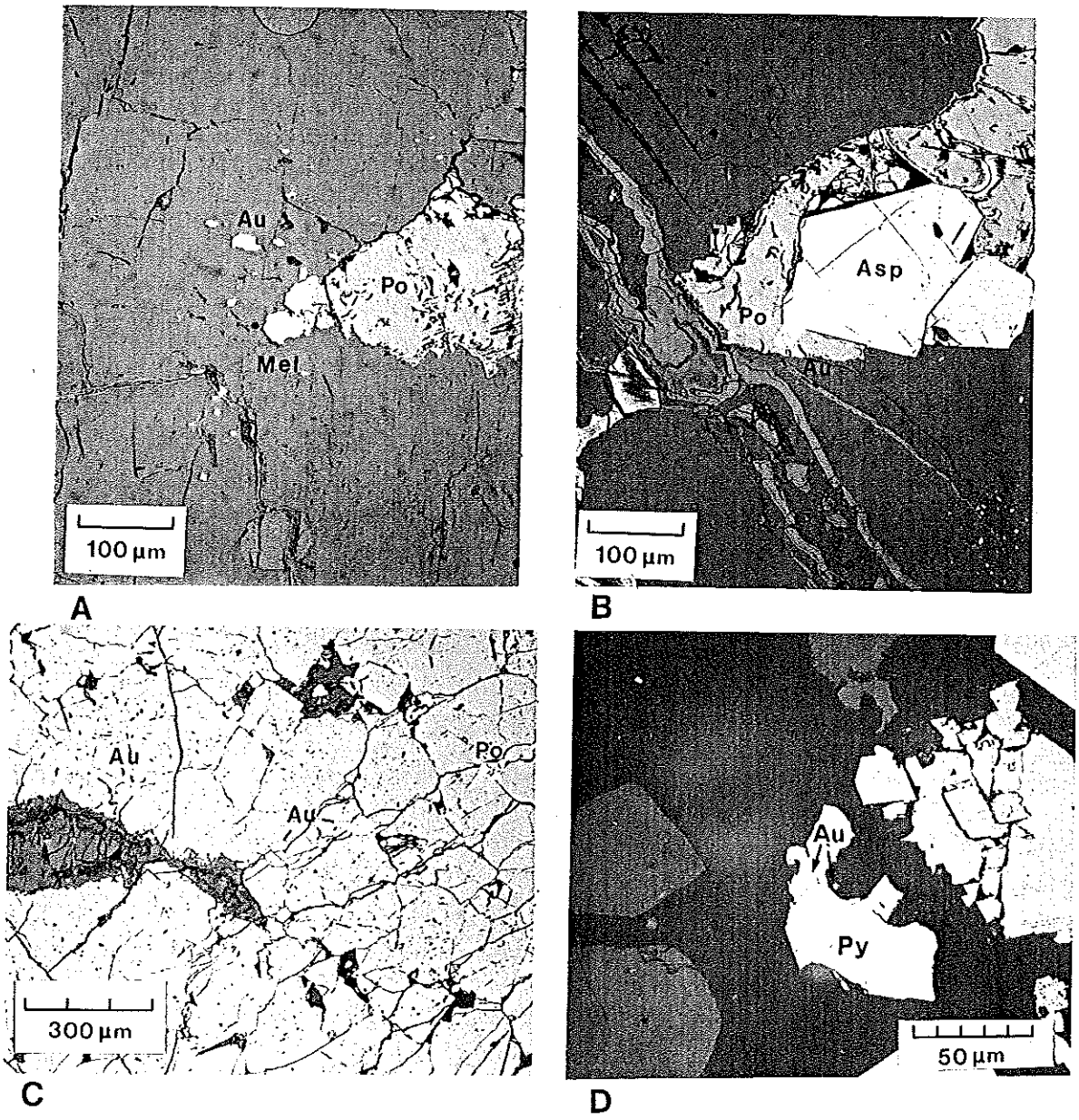

Figure 5. Photomicrographs showing gold textural relationships.

Acknowledgments

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