available commercially. Polyester resins offer a remarkable resistance against weathering and alteration. The main principle of stone conservation in Germany is a critical examination of the damaged object and all the decaying forces in order to apply all technical methods, which are necessary to prevent further attack by destructive agents.

CARBON ISOTOPE COMPOSITION OF SOIL GASES AS AN INDICATOR OF GEOTHERMAL AREAS

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Stable carbon isotope composition and P_{CO_2} of soil gas samples from two profiles in thermal areas of Yellowstone National Park were determined to test these parameters as geothermal exploration tools. Large contrasts in carbon isotope composition were anticipated because it is known that Yellowstone geothermal CO_2 has a range of $\delta^{13}C$ from 0 to -4‰ and biogenic soil CO_2 has a range of $\delta^{13}C$ from about -14 to -13‰ depending on the dominant vegetation type.

All samples were collected from depths of 35 to 76 cm below land surface in areas where conifers were dominant. Except for P_{CO_2} in samples nearest the thermal areas there was little evidence of systematic P_{CO_2} variation from either source.

The $\delta^{13}C$ values from a profile in the vicinity of Sulfur Cauldron, a vapor dominated system, range from -0.3‰ at a point 18 m from the cauldron to -8.6‰ at a point approximately 168 m north of the cauldron. The P_{CO_2} of these samples ranged from $10^{-1.00}$ to $10^{-2.44}$ with very good agreement between volumetric and gas chromatographic determinations. Samples from the Norris Geyser Basin profile yield $\delta^{13}C$ values ranging from -0.9‰ at a point 9 m west of USGS borehole Y-12 to -22.2‰ at a point 305 m northeast. The P_{CO_2} of these samples ranged from $10^{-1.42}$ to $10^{-3.24}$ with only fair agreement between volumetric and chromatographic determinations.

These two profiles indicate an increased contribution of geothermal CO_2 toward the thermal areas and show that this technique has potential in geothermal exploration.

REGIONAL METAMORPHIC THERMAL GRADIENTS AND MAGMATISM

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The common association of abundant plutonic rocks with high temperature-low pressure metamorphic rocks suggests that magmatism may play an important role in regional metamorphism. In New Hampshire and Maine igneous rocks comprise 40 to 50 percent of surface exposures in the high temperature sillimanite zone, but igneous rocks comprise less than 25 percent of rocks in the greenschist facies zone. Using the finite element numerical method, thermal evolution models are calculated to evaluate the effect of magmatism on the thermal regime of the crust. Three dimensional models of intrusive slabs of variable thickness (2, 4 and 6 km thick) and variable radii that are emplaced at 10 to 15 km depth have been examined. In the case of an initial geothermal gradient of greater than 25° C/km and magma temperatures of 1000°C, the maximum temperatures produced in the country rock above intrusives greater than 2 km thick should give rise to high temperature-