BARKATT *ET AL.* REPLY—Ringwood points out that the large radiation-induced enhancement in leach rates reported[1] for Synroc-D has no bearing on the performance of titanate ceramics. This is in complete agreement with the major conclusion of our paper—that the radiolytic *p*H decrease effect leads to a considerable increase in leach rates in the case of waste-form materials which have a high alumina content. We would welcome the opportunity to include high-Ti, low-Al ceramics in future studies. In any case, Ringwood's comments confirm that an aluminosilicate phase has to be introduced in order to immobilize the Cs in defense wastes.

The Synroc-D samples used in our previous studies were prepared at Lawrence Livermore Laboratory. While there may be substantial differences in properties between these and other specimens of Synroc-D, they will indicate that the material is highly sensitive to small variations in fabrication and composition.

Measurements carried out in our laboratories[2] and elsewhere[3] confirm Ringwood's statement that at neutral or mildly alkaline *p*H the leach rate of uranium from Synroc-D is substantially lower than those observed in glasses and also in Rockwell polyphase ceramics. However, in the case of Sr the Rockwell ceramics are less leachable by two orders of magnitude and in the cases of Cs and of the major matrix elements (Al and Si) high-silica glass is much less leachable. Data for some of the most hazardous species (Np, Tc) are not yet available.

The conditions which will prevail during the long service time in a geological repository are highly uncertain and liable to undergo considerable variations. In particular, water coming into contact with the waste form is likely to have a long contact time and to undergo considerable changes due to chemical (selective leaching of soluble species) and radiolytic effects. For example, the original concentration of buffering species in typical ground water (0.90 mmol l^{-1} total CO_2 + 1.3 mmol l^{-1} SiO_2 in basaltic Grande Ronde water) can be quickly overwhelmed by radiolytically produced acid (0.06 mmol l^{-1} day^{-1} total H^+ at a moderate γ dose rate of 8.6×10^4 rad h^{-1}). Indeed, at the end of 7 days of irradiation, the *p*H of such water is observed to drop from 9.5 to <7 when the water is initially air-saturated. At the end of 60 days the *p*H is 4.

Such considerations necessitate testing in a wide variety of conditions and for a large number of components. For example, Soper *et al.*[4] recently used a combination of tests at *p*H values of 3–4, 7 and 10–11 for the optimization of defense waste glass compositions. As Ringwood indicates, it is indeed possible to obtain excellent results with respect to the leachability of a single component at a single *p*H value (for example, U at *p*H 6) through careful tailoring of the waste-form composition to be used with a particular waste stream. However, as emphasized above, a primary consideration in the comparative evaluation of waste forms should be the recognition that the chemical properties of the hazardous elements in waste streams are highly diverse and that the range of possible future conditions in a repository is very broad. Accordingly, evaluation of waste-form materials should emphasize demonstration of a relatively low sensitivity of the leach rates of their various components to changes in the chemical environment rather than performance with respect to a single component in one particular set of conditions.

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Effect of interferon on vesicular stomatitis virus proteins

IN studying the effect of interferon (IFN) on protein glycosylation[1], the cells used by Olden *et al.* were markedly less sensitive to IFN than was the line we have used. With 30 units of IFN they report a 10–20-fold inhibition of production of vesicular stomatitis virus (VSV) particles of unchanged specific infectivity. We agree that this concentration of IFN reduces the number of particles by around 10–20 fold but we regularly see a 300–600-fold inhibition of infectivity at this concentration. This almost certainly accounts for the differences seen between Olden's group and ours in the amount of VSV-associated G protein in virus produced from IFN-treated cells. With only 1/10th to 1/50th of the virus inhibition, it is most unlikely that Olden *et al.* could have seen differences in the quantity of viral G (or, also reported M) protein comparable with those originally reported[2].

We have reported our finding of a reduction in G and M proteins in VSV produced by IFN-treated mouse L_B and the results have been confirmed and extended by Jay[3]. Finally, this work on VSV produced by IFN-treated cells has also been confirmed in this and other laboratories[4,5] with another membrane-associated virus from an entirely different group, murine leukaemia virus (MLV). These studies report that MLV deficient in glycoprotein (gp 67/71) was produced by IFN-treated cells. Another study[6] reported inhibition of the rate of virus protein glycosylation in IFN-treated cells that were infected with MLV.

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OLDEN *ET AL.* REPLY—Friedman and Maheshwari do not dispute the major thesis of our manuscript, that IFN is not an inhibitor of glycosylation as originally claimed[1]. The following quotation taken from the manuscript of Bilello *et al.*[2] supports our finding: "In the SC-1/MCF system, as well as in other cells we have studied, no inhibition of N-linked glycosylation in the presence of IFN has been observed. The envelope glycoprotein both from control and IFN-treated cells contains mannose, fucose and glucosamine".

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0028-0836/83/160728—01$01.00